



# STIC Search Report

## EIC 3700

STIC Database Tracking Number: 196480

**TO: Deborah L Malamud**  
**Location: RND 5d68**  
**Art Unit: 3766**

**Case Serial Number: 10/693375**

**From: Jeanne Horrigan**  
**Location: RND 8A34**  
**Phone: 571-272-3529**

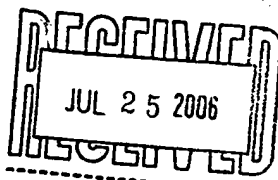
**jeanne.horrigan@uspto.gov**

### Search Notes

Attached are search results for the method of treating sleep disordered breathing. I tagged the items that I thought sounded most relevant, but I recommend that you review all of the results.

Also attached is a search feedback form. Completing the form is voluntary. The completed forms help ensure that our services match your needs.

I hope the results are useful. Please feel free to contact me if you have any questions or want additional searching on this application.



RUSH

Access DB# 196480

## SEARCH REQUEST FORM

Scientific and Technical Information Center

equester's Full Name: Deborah Maramba Examiner #: 81356 Date: 7/25/06  
rt Unit: 3766 Phone Number 302-2106 Serial Number: 10/693, 375  
ail Box and Bldg/Room Location: 5D6B Results Format Preferred (circle): PAPER DISK E-MAIL

more than one search is submitted, please prioritize searches in order of need.

\*\*\*\*\*

lease provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

itle of Invention: Implantable medical device + method for delivery therapy for sleep-disordered breathing  
inventors (please provide full names): Yong K Cho, & Soly Markovitch

arliest Priority Filing Date: 24 Oct 03

\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

aim 14 (amended) - implantable medical device (IMD)  
means for determining sleep-disordered breathing (SDB)  
means for delivering augmentation therapy (AT) when SDB indicated  
• AT = electrical stimulation to increase stroke volume or ventricular pressure - may be excitatory or non-excitatory  
means for providing atrial pacing in combination with AT  
means for calculating a mean heart rate  
herein the atrial pacing means pace the atria at an atrial rate that is multiple of a desired ventricular rate, and the desired ventricular rate is determined based on the mean heart rate

aim 36 (amended) - method of using IMD  
determining SDB presence  
delivering AT if SDB present  
determining a cycle length for a SDB episode  
delivering AT for X number of cycles  
wherein X is selected based on the determined cycle length  
wherein cycle length is an averaged value of multiple SDB episodes

ROBERT E. PEZZUTO  
SUPERVISORY PRIMARY EXAMINER

### TAFF USE ONLY

archer: Jeanne Koryn  
archer Phone #: 23529  
archer Location: \_\_\_\_\_  
ite Searcher Picked Up: \_\_\_\_\_  
ite Completed: \_\_\_\_\_  
archer Prep & Review Time: \_\_\_\_\_  
ritical Prep Time: \_\_\_\_\_  
line Time: \_\_\_\_\_

#### Type of Search

NA Sequence (#) \_\_\_\_\_  
AA Sequence (#) \_\_\_\_\_  
Structure (#) \_\_\_\_\_  
Bibliographic \_\_\_\_\_  
Litigation \_\_\_\_\_  
Fulltext \_\_\_\_\_  
Patent Family \_\_\_\_\_  
Other \_\_\_\_\_

#### Vendors and cost where applicable

STN \_\_\_\_\_  
Dialog [scribble]  
Questel/Orbit \_\_\_\_\_  
Dr. Link \_\_\_\_\_  
Lexis/Nexis \_\_\_\_\_  
Sequence Systems \_\_\_\_\_  
WWW/Internet \_\_\_\_\_  
Other (specify) \_\_\_\_\_

File 155:MEDLINE(R) 1950-2006/Jul 31  
 File 5:Biosis Previews(R) 1969-2006/Jul W4  
 File 71:ELSEVIER BIOBASE 1994-2006/Jul W5  
 File 73:EMBASE 1974-2006/Jul 31  
 File 94:JICST-EPlus 1985-2006/Apr W4  
 File 144:Pascal 1973-2006/Jul W2  
 File 35:Dissertation Abs Online 1861-2006/Jun  
 File 65:Inside Conferences 1993-2006/Jul 27  
 File 431:MediConf: Medical Con. & Events 1998-2004/Oct B2  
 File 2:INSPEC 1898-2006/Jul W4  
 File 6:NTIS 1964-2006/Jul W3  
 File 8:Ei Compendex(R) 1970-2006/Jul W4  
 File 285:BioBusiness(R) 1985-1998/Aug W1  
 File 357:Derwent Biotech Res. 1982-2006/Jul W4  
 File 358:Current BioTech Abs 1983-2006/Jan  
 File 34:SciSearch(R) Cited Ref Sci 1990-2006/Jul W4  
 File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec

Set	Items	Description
S1	73181	SLEEP()DISORDERED()BREATHING OR SLEEP??? (5N) (APNEA OR APNOEA OR HYPOPNEA OR HYPOPNOEIA OR BREATHING()DISORDER? ?) OR PICKWICKIAN()SYNDROME OR SNORE? ? OR SNORING OR UPPER()AIRWAY()RESISTANCE()SYNDROME
S2	10601	((ELECTRIC OR ELECTRICAL OR ELECTRICALLY) (3N)STIMULAT?) (5N-)(HEART OR CARDIAC)
S3	1267	POST() (EXTRA()SYSTOLIC OR EXTRASYSTOLIC) ()POTENTIAT? OR PESP OR (NONEXCITATORY OR NON()EXCITATORY) ()STIMULATION(1W)CARDIAC()CONTRACTILITY()MODULAT??? OR NES()CCM OR (SUBTHRESHOLD OR SUB()THRESHOLD) () (PULSE? ? OR PULSE()TRAIN? ?) OR (PAIRED OR COUPLED) () PA
S4	36751	CYCLE? ? (3N)LENGTH? ?
S5	5560	MEAN()HEART()RATE
S6	4	S1 AND S2:S3
S7	4	RD (unique items)
S8	98	S1 AND S4:S5
S9	411936	EPISODE? ?
S10	0	S1(S)S9()S4
S11	11	S1 AND S4 AND S9
S12	35	S1(S)S5
S13	11	S11 NOT S7
S14	3	RD (unique items)
S15	35	S12 NOT (S6 OR S11)
S16	13	RD (unique items)
S17	13	Sort S16/ALL/PY,A

7/7/4 (Item 4 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

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08905828 PMID: 1907741

**[Follow-up study of patients with sleep-related respiration disorders without obstruction of the upper airways (central apnea)]**

Verlaufsbeobachtung von Patienten mit schlafbezogener Atmungsstörung ohne Obstruktion der oberen Atemwege (zentrale Apnoe).

Dorow P; Thalhofer S

Abteilung Pneumologie, DRK-Krankenhaus Mark Brandenburg, Akademisches Lehrkrankenhaus, Freien Universität Berlin.

Pneumologie (Stuttgart, Germany) (GERMANY) May 1991, 45 Suppl 1

p296-300, ISSN 0934-8387--Print Journal Code: 8906641  
Publishing Model Print  
Document type: Journal Article ; English Abstract  
Languages: GERMAN  
Main Citation Owner: NLM  
Record type: MEDLINE; Completed

This is a report on 16 patients with central asphyxia. All patients had respiratory global insufficiency. The period of observation was 3.5 years. In all cases deterioration of the blood gases took place. All patients died due to right heart failure. **Implantation of a diaphragm pacer caused an increase of pO2 during sleep.**

Record Date Created: 19910912  
Record Date Completed: 19910912

14/7/1 (Item 1 from file: 155)  
DIALOG(R)File 155:MEDLINE(R)

(c) format only 2006 Dialog. All rts. reserv.  
13596891 PMID: 11208683

**Overnight shift from obstructive to central apneas in patients with heart failure: role of PCO2 and circulatory delay.**

Tkacova R; Niroumand M; Lorenzi-Filho G; Bradley T D

**Sleep** Research Laboratory of the Toronto Rehabilitation Institute and the Department of Medicine of the Toronto General Hospital/University Health Network, University of Toronto, Toronto, Ontario, Canada.

Circulation (United States) Jan 16 2001, 103 (2) p238-43, ISSN 0009-7322--Print Journal Code: 0147763

Publishing Model Print  
Document type: Journal Article  
Languages: ENGLISH  
Main Citation Owner: NLM  
Record type: MEDLINE; Completed

BACKGROUND: Obstructive (OSA) and central **sleep apnea** (CSA) can coexist in patients with congestive **heart failure** (CHF). However, the reason why OSA events occur at one time and CSA events at another has not been determined. We hypothesized that a change in PCO(2) would be associated with an alteration in **apnea** type: a decrease in PCO(2) should lead to CSA. METHODS AND RESULTS: To test this hypothesis, we evaluated minute ventilation (V(I)), transcutaneous PCO(2) (PtcCO(2)), circulation time, and **periodic breathing cycle length** during overnight polysomnography in 12 patients with CHF and coexisting OSA and CSA. V(I) was significantly greater (mean+/-SEM, 9.4+/-1.3 versus 8.0+/-0.9 L/min; P:<0.05) and PtcCO(2) was lower (39.4+/-1.0 versus 41.9+/-1.1 mm Hg, P:<0.01) during **episodes** of CSA than of OSA. These changes were associated with significant **lengthening** of circulation time (23.6+/-3.7 versus 21.1+/-3.6 seconds, P:<0.01) and **periodic breathing cycle length** (53.7+/-3.5 versus 49.6+/-2.9 seconds, P:<0.01). In addition, the proportion of obstructive events decreased (from 68.5+/-11.4% to 22.5+/-7.2%, P:<0.001) and of CSA events increased (from 31.5+/-11.4% to 77.5+/-7.2%, P:<0.001) from the first to the last quarter of the night in association with a significant decrease in PtcCO(2) (from 42.6+/-0.9 to 40.8+/-0.9 mm Hg, P:<0.01). CONCLUSIONS: In patients with CHF, the shift from OSA to CSA is associated with a reduction in PCO(2). This appears to be related to an overnight deterioration in **cardiac** function as suggested by the concurrent **lengthening** of circulation time. Therefore, in CHF patients, alterations in **cardiac** function may influence **apnea** type.

Record Date Created: 20040708  
Record Date Completed: 20040729

14/7/2 (Item 2 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

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11024851 PMID: 8843527

**Augmented very low frequency component of heart rate variability during obstructive sleep apnea .**

Shiomi T; Guilleminault C; Sasanabe R; Hirota I; Maekawa M; Kobayashi T  
Third Department of Medicine, Aichi Medical University, Japan.

**Sleep** (UNITED STATES) Jun 1996, 19 (5) p370-7, ISSN 0161-8105--  
Print Journal Code: 7809084

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

After documenting the presence of obstructive sleep apnea syndrome (OSAS) through polysomnographic monitoring, we performed simultaneous ambulatory recordings of electrocardiogram, oronasal airflow, and pulse oximetry on 12 OSAS patients with normal autonomic nervous function for a period of 24 hours. The power spectrum of heart rate variability was investigated before and during treatments using dental appliances. Frequency domain analysis showed that the very low frequency component of heart rate (0.008-0.04 Hz) was increased in OSAS patients and that a very low frequency peak appeared during episodes of obstructive sleep apnea. The increase in very low frequency identification was synchronized with episodes of absence of air exchange or hypoxemia (decreased arterial oxygen saturation) that occurred repeatedly at a cycle length of 25-120 seconds in our subjects. Frequency domain analysis of heart rate variability before and during prosthetic mandibular advancement treatment showed that only the very low frequency was significantly decreased during prosthetic mandibular advancement treatment, whereas the other frequencies, i.e. high, low, and ultralow frequency component values, showed no significant changes. Time domain analysis of heart rate variability before and during prosthetic mandibular advancement treatment showed no significant changes in any of these parameters. Frequency domain analysis of heart rate variability during nocturnal sleep, especially investigation of very low frequency and very low frequency peak, can be a noninvasive low-cost approach to diagnose and even better monitor subjects undergoing treatment at home, particularly considering that R-R intervals can be extracted from pulse oximetry and that analysis software programs are already commercially available.

Record Date Created: 19961226

Record Date Completed: 19961226

17/6/8 (Item 8 from file: 155)

13377453 PMID: 11549537

**Cardiac autonomic control in obstructive sleep apnea: effects of long-term CPAP therapy.**

Sep 1 2001

17/7/1 (Item 1 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

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06770191 PMID: 4030607

**Changes in heart rate during breathing interrupted by recurrent apneas in humans.**

Findley L J; Farkas G A; Rochester D F

Journal of applied physiology (Bethesda, Md. - 1985) (UNITED STATES)

Aug 1985, 59 (2) p536-42, ISSN 8750-7587--Print Journal Code: 8502536

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

**Heart rate** varies with **breathing** patterns, especially in **sleep apnea**. To assess the effects on **heart rate** of recurrent **apneas** interrupting tidal **breathing**, we studied five normal awake male subjects. These subjects voluntarily changed their **breathing** pattern from regular tidal **breathing** to tidal **breathing** interrupted by breath holding at end expiration. This recurrent apneic **breathing** pattern did not change **mean heart rate** but increased its variance significantly. In addition, the variations in **heart rate** formed a cyclic pattern of oscillation with a mean **cycle length** identical to both arterial O<sub>2</sub> saturation (SaO<sub>2</sub>) (R = 0.95; P less than 0.01) and ventilation (R = 0.92; P less than 0.01). Cyclic changes in either SaO<sub>2</sub> or ventilation reproduced the oscillatory patterns of **heart rate** seen with tidal **breathing** interrupted by multiple **apneas**, but the amplitude of the variance in **heart rate** was smaller. Finally, preventing the cyclic declines in SaO<sub>2</sub> with supplemental O<sub>2</sub> did not significantly alter the **heart rate** changes seen in tidal **breathing** interrupted by **apneas**.

Record Date Created: 19851021

Record Date Completed: 19851021

17/7/3 (Item 3 from file: 155)

DIALOG(R)File 155:MEDLINE(R)

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07111268 PMID: 3752011

**Abnormal sleeping ventilatory pattern in infants of substance-abusing mothers.**

Ward S L; Schuetz S; Kirshna V; Bean X; Wingert W; Wachsmann L; Keens T G

American journal of diseases of children (1960) (UNITED STATES) Oct 1986, 140 (10) p1015-20, ISSN 0002-922X--Print Journal Code: 0370471

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Infants born to opiate-abusing mothers have a decreased ventilatory response to carbon dioxide and a five to ten times increased risk of sudden infant death syndrome (SIDS). These abnormalities of ventilatory control may be associated with abnormal **sleeping** ventilatory patterns. Therefore, 28 overnight pneumograms (respiratory pattern recording and electrocardiogram) were obtained from 27 infants of substance-abusing mothers (ISAM) (five opiate, seven phencyclidine hydrochloride, three cocaine, and 12 polydrug abusers) and compared with pneumograms from 43 control infants. Pneumograms were quantitated for total **sleep** time,

greatest duration of **apnea**, total duration of **apnea** greater than or equal to 6 s, periodic **breathing**, and mean **heart** and respiratory rates. The ISAM had a longer total **sleep** time, greater durations of **apnea**, a higher total duration of **apneas** greater than or equal to 6 s, more periodic **breathing**, a higher mean respiratory rate, and a lower **mean heart rate**. Thirty-two percent of pneumograms from ISAM were abnormal compared with 9.3% of the control pneumograms. We conclude that ISAM have abnormal **sleeping** ventilatory patterns that may be related to their increased SIDS risk.

Record Date Created: 19861023

Record Date Completed: 19861023

17/7/4 (Item 4 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

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08429685 PMID: 2327336 Record Identifier: 90224842

**The sleep electrocardiogram at extreme altitudes (Operation Everest II)**

Malconian M; Hultgren H; Nitta M; Anholm J; Houston C; Fails H

United States Army Research Institute of Environmental Medicine, Natick, Massachusetts.

American journal of cardiology (UNITED STATES) Apr 15 1990, 65 (15)

p1014-20, ISSN 0002-9149--Print Journal Code: 0207277

Publishing Model Print; Comment in Am J Cardiol. 1991 Feb 1;67(4) 329; Comment in PMID 1990812

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Other Citation Owner: NASA

Record type: MEDLINE; Completed

To evaluate the effect of **sleep** at extreme altitudes upon **heart rate** and rhythm, continuous **sleep** monitoring was performed in 8 normal young men during a 40-day simulated ascent of Mt. Everest in a hypobaric chamber. Recordings were made for 1 hour before **sleep**, during **sleep** and for 1 hour after awakening in all subjects at 760 torr (sea level), in 7 subjects at 390 torr (5,490 m), in 6 at 347 torr (6,100 m) and in 4 at 282 torr (7,620 m). The following results were obtained: periods of sinus bradycardia occurred during **sleep** in all subjects at 3 altitudes with a mean **heart rate** of 41 +/- 0.5 beats/min compared to a rate of 44 +/- 2 beats/min at sea level; cycling of the **heart rate**, presumably due to periodic **breathing**, occurred in 14 of 17 studies at altitude but not at sea level (**cycles** consisted of bradycardia [40 beats/min] for 13 seconds and tachycardia [120 beats/min for 5 seconds]; and arrhythmias were observed in all subjects during **sleep** and consisted of transient bradycardia (**heart rates** as low as 20 beats/min), sinus pauses frequently associated with escape rhythms and occasional blocked P waves. No arrhythmias were observed at sea level. Simultaneous records of respiration and the electrocardiogram at 12,500 feet (3,810 m) in 5 other normal subjects revealed tachycardia occurring during hyperpnea and bradycardia occurring during **apnea**. Data indicate that during **sleep** in normal young subjects at high altitude, cycling of the **heart rate** with periodic **breathing** is common, as are bradyarrhythmias. The mechanism of these arrhythmias has yet to be defined.

Record Date Created: 19900511

Record Date Completed: 19900511

17/7/5 (Item 5 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

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10676170 PMID: 7488453

**Heart rate and respiratory rhythm dynamics on ascent to high altitude.**

Lipsitz L A; Hashimoto F; Lubowsky L P; Mietus J; Moody G B; Appenzeller O; Goldberger A L Goldberger A L Beth Israel Hosp, Boston, MA

Hebrew Rehabilitation Center for Aged Research and Training Institute, Boston, MA 02131, USA.

British **heart** journal (ENGLAND) Oct 1995, 74 (4) p390-6, ISSN 0007-0769--Print Journal Code: 0370634

Contract/Grant No.: AG04390; AG; NIA; AG08812; AG; NIA; PO1-DA06316; DA; NIDA; +

Publishing Model Print

Document type: Case Reports; Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

OBJECTIVE--To investigate the alterations in autonomic control of **heart** rate at high altitude and to test the hypothesis that hypoxaemic stress during exposure to high altitude induces non-linear, periodic **heart rate** oscillations, similar to those seen in **heart** failure and the **sleep apnoea** syndrome. SUBJECTS--11 healthy subjects aged 24-64. MAIN OUTCOME MEASURES--24 hour ambulatory electrocardiogram records obtained at baseline (1524 m) and at 4700 m. Simultaneous **heart rate** and respiratory dynamics during 2.5 hours of **sleep** by fast Fourier transform analysis of beat to beat **heart rate** and of an electrocardiographically derived respiration signal. RESULTS--All subjects had resting hypoxaemia at high altitude, with an average oxyhaemoglobin saturation of 81% (5%). There was no significant change in **mean heart rate**, but low frequency (0.01-0.05 Hz) spectral power was increased ( $P < 0.01$ ) at high altitude. Time series analysis showed a complex range of non-linear sinus rhythm dynamics. Striking low frequency (0.04-0.06 Hz) **heart rate** oscillations were observed during **sleep** in eight subjects at high altitude. Analysis of the electrocardiographically derived respiration signal indicated that these **heart rate** oscillations correlated with low frequency respiratory oscillations. CONCLUSIONS--These data suggest (a) that increased low frequency power during high altitude exposure is not simply attributable to increased sympathetic modulation of **heart rate**, but relates to distinctive cardiopulmonary oscillations at approximately 0.05 Hz and (b) that the emergence of periodic **heart rate** oscillations at high altitude is consistent with an unstable cardiopulmonary control system that may develop on acute exposure to hypoxaemic stress.

Record Date Created: 19960102

Record Date Completed: 19960102

17/7/6 (Item 6 from file: 155)

DIALOG(R) File 155:MEDLINE(R)

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12745114 PMID: 10849245

**Transient cardiorespiratory events during NREM sleep: a feline model for human microarousals.**

Quattrochi J J; Shapiro J; Verrier R L; Hobson J A

Laboratory of Neurophysiology, Program in Neuroscience, Harvard Medical School, Boston, USA. jq@hms.harvard.edu

Journal of **sleep** research (ENGLAND) Jun 2000, 9 (2) p185-91, ISSN



0962-1105--Print Journal Code: 9214441

Contract/Grant No.: HL50078; HL; NHLBI; MH13923; MH; NIMH

Publishing Model Print

Document type: Journal Article

Languages: ENGLISH

Main Citation Owner: NLM

Record type: MEDLINE; Completed

Microarousals (MAs) are brief transient events that occur during normal **sleep** in humans and with increased frequency in disordered **sleep**, especially in association with **sleep apnoea**. In a feline model, we discovered transient cardiorespiratory events during nonrapid eye movement (NREM) **sleep** that exhibited consistent features with similarities to human MAs. It was observed that MAs have two distinct phases. Phase I (MAI) is characterized by an abrupt increase in electromyogram (EMG) amplitude (> 50%), increased electrooculogram (EOG) activity and accelerated frequency of hippocampal electroencephalographic (EEG) activity. MAI lasts 4.1 +/- 0.3 s. Phase II (MAII), lasting 9.8 +/- 0.8 s, is characterized by high frequency EEG activity, but EMG, EOG and hippocampal activity remain at baseline levels. Mean inspiratory rate begins to increase 15 s before the onset of the MA, followed 10 s later by the increase in **mean heart rate**. Mean respiratory rate decreases sharply through MAII, and returns to baseline levels 15 s after the MA. During MAII **mean heart rate** decreases quickly; there is increased respiratory irregularity, followed by a prolonged ventilatory overshoot. The abrupt shift in **heart rate** is coincident with the change in breath timing seen during MAII. **Heart rate** returns to baseline levels 10 s following the MA. Integrating our findings with those described previously in humans, we propose that MAs may serve as a homeostatic mechanism which is designed to restore cardiorespiratory function allowing the continuity of **sleep**.

Record Date Created: 20000815

Record Date Completed: 20000815

17/7/7 (Item 7 from file: 2)

DIALOG(R)File 2:INSPEC

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08432418 INSPEC Abstract Number: A2002-23-8745-103, B2002-12-7510-027, C2002-12-1290L-040

**Title: Cardiovascular variability in obstructive sleep apnea: a closed-loop analysis**

Author(s): Jo, J.A.; Khoo, M.C.K.; Blasi, A.; Baydur, A.; Juarez, R.

Author Affiliation: Dept. of Biomed. Eng., Univ. of Southern California, Los Angeles, CA, USA

Conference Title: 2001 Conference Proceedings of the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society (Cat. No.01CH37272) Part vol.1 p.511-14 vol.1

Publisher: IEEE, Piscataway, NJ, USA

Publication Date: 2001 Country of Publication: USA 4 vol. 4132 pp.

ISBN: 0 7803 7211 5 Material Identity Number: XX-2002-02140

U.S. Copyright Clearance Center Code: 0-7803-7211-5/01/\$17.00

Conference Title: 2001 Conference Proceedings of the 23rd Annual International Conference of the IEEE Engineering in Medicine and Biology Society

Conference Date: 25-28 Oct. 2001 Conference Location: Istanbul, Turkey

Medium: Also available on CD-ROM in PDF format

Language: English Document Type: Conference Paper (PA)

**Treatment:** Theoretical (T); Experimental (X)

**Abstract:** We have developed a model-based approach for estimating the dynamic effects of respiration on **heart rate** ("RSA") and arterial pressure ("MER"), along with the baroreflex response ("ABR") and the feedforward effect of **heart rate** on blood pressure ("CID") from a single test procedure. Respiration, **heart rate**, continuous blood pressure and other polysomnographic variables were monitored in 9 normals and 8 untreated patients with obstructive **sleep apnea** (OSA). A computer-controlled ventilator was used to vary ventilatory pattern in a randomized breath-to-breath sequence. Using closed-loop model analysis, we estimated the parameters that characterize RSA, ABR, CID and MER. RSA and ABR gains were significantly lower in OSA than normals. During **sleep**, ABR gain increased threefold in normals but remained unchanged in OSA. CID gain was higher in OSA relative to normals, suggesting increased peripheral vascular resistance. MER gain was also higher in OSA, but only in wakefulness. Apart from increased **mean heart rate** in OSA, there were no significant differences in other summary and spectral measures of cardiovascular variability. Our approach represents a sensitive, clinically practicable and comprehensive means of assessing autonomic function in OSA during both wakefulness and **sleep**. (7 Refs) Subfile: A B C

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17/7/9 (Item 9 from file: 73)

DIALOG(R)File 73:EMBASE

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12138831 EMBASE No: 2003249708

Role of cardiac pacing in sleep apnea uncertain. Article reviewed: S. Garrigue, P. Bordier, P. Jais, et al., benefit of atrial pacing in sleep apnea syndrome, N Engl J Med. 346 (2002) 404-412

Gottlieb D.J.

D.J. Gottlieb, The Pulmonary Center, Boston University School of Medicine, Boston, MA United States

AUTHOR EMAIL: dgottlieb@lung.bumc.bu.edu

**Sleep Medicine** ( **SLEEP MED.** ) (Netherlands) 2003, 4/3 (259-260)

CODEN: SMLEA ISSN: 1389-9457

DOCUMENT TYPE: Journal ; Review

LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH

NUMBER OF REFERENCES: 5

**Objectives:** To determine the effect of atrial overdrive pacing on **sleep apnea** severity in patients with sinus node dysfunction. **Study design:** Unblinded, cross-over study of the effect of atrial pacing on **sleep apnea - hypopnea**, with randomized order of study conditions (paced versus unpaced). **Study population:** Fifteen patients (11 men, 4 women), mean age 69 (SD 9) years, with sinus node dysfunction and permanent dual-chamber pacemakers, with polysomnographic evidence of either central or obstructive **sleep apnea - hypopnea** (mean **apnea - hypopnea** index (AHI) 27 (SD 16)). None had symptomatic **heart** failure, but 11 (73%) had mildly reduced left ventricular ejection fraction (40-56%). **Methods:** One hundred and fifty-two patients with pacemakers implanted at least one year previously for symptomatic sinus node dysfunction (including tachycardia-bradycardia syndrome) were screened for symptoms of **sleep apnea**. Of 47 patients identified, 26 underwent polysomnography and 15 had an **apnea** index > 5/h and an AHI > 15/h. Following the baseline polysomnogram, subjects underwent polysomnography on the subsequent two nights under the following conditions, in random order: (1) pacemaker set at a rate 15 beats/min

higher than the **mean heart rate** of the diagnostic study (overdrive pacing phase); and (2) pacemaker rate reduced to 40 beats/min (no-pacing phase). The main outcome measure was the difference in AHI between the two pacing modes. Results: Mean nocturnal **heart rate** during the pacing phase was 72/min, versus 51/min during the no-pacing phase. During the no-pacing phase, AHI was unchanged from the baseline night at 28/h (SD 22). During overdrive pacing, however; the AHI was 61% lower at 11/h (SD 14). The AHI was lower on the pacing than the no-pacing night in all 15 subjects, regardless of whether the predominant type of **apnea** was central or obstructive. The mean central **apnea** index fell from 13 (SD 17) to 6 (SD 7), and the obstructive **apnea** index from 6 (SD 4) to 3 (SD 1). Both lowest oxyhemoglobin saturation and the percent time at saturation below 90% also improved on the pacing night. There was little difference in total **sleep** time between pacing and no-pacing nights; other measures of **sleep** quality were not reported. Conclusions: The authors conclude that atrial overdrive pacing at a relatively modest rate causes a substantial improvement in both central and obstructive **sleep apnea**, by mechanisms that are uncertain.

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File 149:TGG Health&Wellness DB(SM) 1976-2006/Jul W3  
 File 129:PHIND(Archival) 1980-2006/Jul W4  
 File 135:NewsRx Weekly Reports 1995-2006/Jul W4  
 File 441:ESPICOM Pharm&Med DEVICE NEWS 2006/Feb W2  
 File 148:Gale Group Trade & Industry DB 1976-2006/Jul 28  
 File 16:Gale Group PROMT(R) 1990-2006/Jul 28  
 File 160:Gale Group PROMT(R) 1972-1989  
 File 621:Gale Group New Prod.Annou.(R) 1985-2006/Jul 28  
 File 635:Business Dateline(R) 1985-2006/Jul 29  
 File 636:Gale Group Newsletter DB(TM) 1987-2006/Jul 28  
 File 9:Business & Industry(R) Jul/1994-2006/Jul 28

Set	Items	Description
S1	13313	SLEEP()DISORDERED()BREATHING OR SLEEP??? (5N) (APNEA OR APNOEA OR HYPOPNEA OR HYPOPNOEA OR BREATHING()DISORDER? ?) OR PICKWICKIAN()SYNDROME OR SNORE? ? OR SNORING OR UPPER()AIRWAY()RESISTANCE()SYNDROME
S2	402	((ELECTRIC OR ELECTRICAL OR ELECTRICALLY) (3N)STIMULAT?) (5N- ) (HEART OR CARDIAC)
S3	96	POST() (EXTRA()SYSTOLIC OR EXTRASYSTOLIC) ()POTENTIAT? OR PESP OR (NONEXCITATORY OR NON()EXCITATORY) ()STIMULATION(1W)CARDIAC() CONTRACTILITY()MODULAT??? OR NES()CCM OR (SUBTHRESHOLD OR SUB()THRESHOLD) () (PULSE? ? OR PULSE()TRAIN? ?) OR (PAIRED OR COUPLED) () PA
S4	20712	CYCLE? ? (3N)LENGTH? ?
S5	285	MEAN()HEART()RATE
S6	0	S1(S)S2:S3
S7	4	S1(S)S5
S8	5	S1(S)S4
S9	9	S7:S8
S10	8	RD (unique items)
S11	8	Sort S10/ALL/PD,A

11/3,K/1 (Item 1 from file: 149)

DIALOG(R)File 149:TGG Health&Wellness DB(SM)

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01612731 SUPPLIER NUMBER: 18022378 (USE FORMAT 7 OR 9 FOR FULL TEXT)

**Accuracy of oximetry for detection of respiratory disturbances in sleep apnea syndrome.**

Levy, Patrick; Pepin, Jean Louis; Deschaux-Blanc, C.; Paramelle, B.;

Brabilla, Christian

Chest, v109, n2, p395(5)

Feb, 1996

PUBLICATION FORMAT: Magazine/Journal ISSN: 0012-3692 LANGUAGE: English

RECORD TYPE: Fulltext TARGET AUDIENCE: Professional

WORD COUNT: 3916 LINE COUNT: 00347

... 3-s response. Warley et al[23] studied the ability of this algorithm to reproduce **cycle lengths** of [SaO.sub.2] (similar to that observed in **sleep apnea**). They concluded that 12-s sampling frequency allowed reasonable resolution of [SaO.sub.2] variability...

11/3,K/2 (Item 2 from file: 149)

DIALOG(R)File 149:TGG Health&Wellness DB(SM)

(c) 2006 The Gale Group. All rts. reserv.

01703050 SUPPLIER NUMBER: 19553164 (USE FORMAT 7 OR 9 FOR FULL TEXT)

**Prevalence of sleep-disordered breathing in diastolic heart failure.**

Chan, Joseph; Sanderson, John; Chan, Wilson; Lai, Christopher; Choy, Dominic; Ho, Alice; Leung, Roland  
Chest, v111, n6, p1488(6)  
June, 1997

PUBLICATION FORMAT: Magazine/Journal ISSN: 0012-3692 LANGUAGE: English  
RECORD TYPE: Fulltext TARGET AUDIENCE: Professional

WORD COUNT: 3945 LINE COUNT: 00341

... 11/20) had significant SDB as defined previously. Seven of these patients had predominantly obstructive **sleep apnea** (OSA) (mean obstructive AHI = 10.9 (+ or -) 5.1), while the remaining four patients had predominantly central **sleep apnea** (mean central AHI = 7.5 (+ or -) 7.0), with two of them exhibiting CSR. The...

...typical of patients with CHF. The ratio of **apnea length** to total (**apnea** and ventilation) **cycle length** in these two patients with CSR was less than half, again suggesting that circulatory delay...

**11/3,K/3 (Item 3 from file: 149)**

DIALOG(R) File 149:TGG Health&Wellness DB(SM)

(c) 2006 The Gale Group. All rts. reserv.

01758912 SUPPLIER NUMBER: 20369787 (USE FORMAT 7 OR 9 FOR FULL TEXT)

**Effects of cardiac dysfunction on non-hypercapnic central sleep apnea.**

Solin, Peter; Roebuck, Teanau; Swieca, John; Walters, E. Haydn; Naughton, Matthew T.

Chest, v113, n1, p104(7)

Jan, 1998

PUBLICATION FORMAT: Magazine/Journal; Refereed ISSN: 0012-3692

LANGUAGE: English RECORD TYPE: Fulltext TARGET AUDIENCE: Professional

WORD COUNT: 3812 LINE COUNT: 00336

... presence of CHF in subjects with CSA.

(CHEST 1998; 113:104-10)

Key words: central **sleep apnea** ; circulation time; **cycle length** ; **heart failure**

Abbreviations: AL = **apnea length**; CHF = congestive **heart failure**; CL = **cycle length** ; CSA = central **sleep apnea** ;

EMG = electromyogram; LVEF = left ventricular ejection fraction;  
non-REM = nonrapid eye movement; (PtcCO.sub.2...

**11/3,K/4 (Item 4 from file: 149)**

DIALOG(R) File 149:TGG Health&Wellness DB(SM)

(c) 2006 The Gale Group. All rts. reserv.

01974630 SUPPLIER NUMBER: 71403700 (USE FORMAT 7 OR 9 FOR FULL TEXT)

**Breath-to-Breath Variability Correlates With Apnea-Hypopnea Index in Obstructive Sleep Apnea(\*)**.

Kowallik, Peter; Jacobi, Ilka; Jirmann, Alexander; Meesmann, Malte; Schmidt, Michael; Wirtz, Hubert

Chest, 119, 2, 451

Feb, 2001

PUBLICATION FORMAT: Magazine/Journal; Refereed ISSN: 0012-3692

LANGUAGE: English RECORD TYPE: Fulltext TARGET AUDIENCE: Professional

WORD COUNT: 4820 LINE COUNT: 00395

... airway pressure; OSA = obstructive **sleep apnea**; REM = rapid eye movement; UARS = upper-airway resistance syndrome

**Sleep - disordered breathing** is a widespread disease(1) with varying forms of manifestation.(2) The most severe form is obstructive

**sleep apnea** (OSA), with daytime **sleepiness** and associated cardiovascular disease and other sequelae.(3-5) The underlying...  
...Diagnosis of OSA involves screening as well as respiratory nocturnal polysomnography.(9) For detection of **upper - airway resistance syndrome** (UARS), measurement of esophageal pressure in combination with arousal detection is the "gold standard."(10...  
...resistance of the **upper airway** will lead to changes in the flow contour(11) and **lengths** of the **breathing cycle** , as well as increasing the variability of breath- **cycle length** .(12,13) Thus, **sleep - disordered breathing** with the common underlying condition of increased upper-airway resistance may be characterized by a varying degree of breath **cycle - length** variability different from the normal pattern of **breathing**.  
The purpose of this study was to...

11/3,K/6 (Item 6 from file: 441)  
DIALOG(R)File 441:ESPICOM Pharm&Med DEVICE NEWS  
(c) 2006 ESPICOM Bus.Intell. All rts. reserv.  
00047482 00051289 (USE FORMAT 7 OR 9 FOR FULLTEXT)  
St Jude Medical begins BREATHE enrolment  
Medical Industry Week  
29 October 2002 (20021029)  
RECORD TYPE: FULLTEXT WORD COUNT: 391  
COMPANY: St Jude Medical  
(THIS IS THE FULLTEXT)  
TEXT:

...significantly reduced in pacemaker patients who had their pacemakers programmed to 15 beats above their **mean heart rate** at night, when compared to either baseline or single-chamber (VVI) pacing at 40 beats a minute. A decreased nocturnal oxygen saturation is a known consequence of **sleep apnoea** .  
The primary endpoint of the BREATHE study is the **apnea-hypopnea** index (AHI) at one...

11/3,K/5 (Item 5 from file: 148)  
DIALOG(R)File 148:Gale Group Trade & Industry DB  
(c)2006 The Gale Group. All rts. reserv.  
15121124 SUPPLIER NUMBER: 93514687 (USE FORMAT 7 OR 9 FOR FULL TEXT)  
St. Jude Medical Begins Evaluation of New Therapy for Sleep Apnea in Pacemaker Patients; First Patient Enrolled in Multicenter BREATHE Clinical Trial.  
Business Wire, 2117  
Oct 29, 2002  
LANGUAGE: English RECORD TYPE: Fulltext  
WORD COUNT: 1053 LINE COUNT: 00091  
... at 40 beats a minute. A decreased nocturnal oxygen saturation is a known consequence of **sleep apnea** . Balaban et al. showed a correlation between nocturnal oxygen saturation and base rate setting in pacemaker patients diagnosed with **sleep apnea** .(8)  
"The BREATHE trial follows the pattern established in the Adopt-A AF Suppression trial..."

File 350:Derwent WPIX 1963-2006/UD=200648

(c) 2006 The Thomson Corporation

File 347:JAPIO Dec 1976-2005/Dec(Updated 060404)

(c) 2006 JPO & JAPIO

Set	Items	Description
S1	2563	SLEEP()DISORDERED()BREATHING OR SLEEP??? (5N) (APNEA OR APNOEA OR HYPOPNEA OR HYPOPNOEA OR BREATHING()DISORDER? ?) OR PICKWICKIAN()SYNDROME OR SNORE? ? OR SNORING OR UPPER()AIRWAY()RESISTANCE()SYNDROME
S2	504	((ELECTRIC OR ELECTRICAL OR ELECTRICALLY) (3N)STIMULAT?) (5N-)(HEART OR CARDIAC)
S3	30	POST() (EXTRA()SYSTOLIC OR EXTRASYSTOLIC) ()POTENTIAT? OR PESP OR (NONEXCITATORY OR NON()EXCITATORY) ()STIMULATION(1W)CARDIAC()CONTRACTILITY()MODULAT??? OR NES()CCM OR (SUBTHRESHOLD OR SUB()THRESHOLD) () (PULSE? ? OR PULSE()TRAIN? ?) OR (PAIRED OR COUPLED) () PA
S4	1933	CYCLE? ? (3N)LENGTH? ?
S5	12	MEAN()HEART()RATE
S6	5	<b>S1 AND S2:S3</b>
S7	0	S1 AND S5
S8	3	S1 AND S4
S9	3	<b>S8 NOT S6</b>
S10	2336250	ELECTRIC OR ELECTRICAL OR ELECTRICALLY
S11	83610	STIMULAT?
S12	69216	HEART OR CARDIAC
S13	62	S1 AND S10:S11 (S) S12
S14	1792214	TREAT?
S15	158741	THERAP?
S16	47	S13 AND S14:S15
S17	42	S16 NOT S6:S8
S18	114280	IC=(A61N-001? OR A61B-005?)
S19	27	<b>S17 AND S18</b>
S20	25	S1 AND S10:S11 (5N)S12
S21	5	<b>S20 NOT (S6:S8 OR S19)</b>

6/7/2 (Item 2 from file: 350)

DIALOG(R)File 350:Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.

0014964792 - Drawing available

WPI ACC NO: 2005-312587/200532

Related WPI Acc No: 2004-775570; 2004-775573; 2004-784515; 2004-784516; 2005-201771; 2005-211193; 2005-211722; 2005-221161; 2005-222940; 2005-232358; 2005-232359; 2005-241209; 2005-252434; 2005-261232; 2005-271829; 2005-284947; 2005-293886; 2005-312586; 2005-365896; 2005-403165; 2006-340411

XRPX Acc No: N2005-255318

**Patient disordered breathing treating method, involves coordinating delivery of external respiratory therapy and cardiac therapy using processor, based on sensed conditions associated with disordered breathing**

Patent Assignee: **CARDIAC PACEMAKERS INC (CARD-N)**

Inventor: HARTLEY J W; LEE K; NI Q; STAHMANN J E

**Patent Family** (1 patents, 1 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20050061320	A1	20050324	US 2003504561	P	20030918	200532 B
			US 2004930979	A	20040831	

Priority Applications (no., kind, date): US 2003504561 P 20030918; US  
2004930979 A 20040831

**Patent Details**

Number Kind Lan Pg Dwg Filing Notes

US 20050061320 A1 EN 51 24 Related to Provisional US 2003504561

**Alerting Abstract US A1**

NOVELTY - The method involves controlling an external respiratory **therapy** and a **cardiac therapy** delivered to a patient. Conditions associated with an impact of disordered **breathing** during **sleep** of the patient are sensed by a sensor system. Delivery of the external respiratory **therapy** and **cardiac therapy** are coordinated using a processor, based on the sensed conditions by the sensor system.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a medical system for controlling **therapy** to **treat** disordered **breathing**.

USE - Used for **treating** disordered **breathing** of a patient.

ADVANTAGE - The method coordinates external respiratory and **cardiac therapies** delivered to the patient, thus enhancing effectiveness of the **therapies**, and hence reducing **therapy** interactions, improving patient **sleep**, achieving other **therapeutic** goals.

DESCRIPTION OF DRAWINGS - The drawing shows a flowchart illustrating methods that involve controlling and coordinating **cardiac therapy** and respiratory **therapy** in order to coordinate **sleep disordered breathing therapy**.

**Class Codes**

International Classification (Main): A61M-016/00

(Additional/Secondary): A62B-007/00

US Classification, Issued: 128204230, 128204180

Claim: What is claimed is:

**\*\*1\*\***. An automated method for **treating** disordered **breathing**,  
comprising:

- \* controlling an external respiratory **therapy** delivered to a patient;
- \* controlling a **cardiac therapy** delivered to the patient; and
- \* coordinating delivery of the external respiratory **therapy** and the **cardiac therapy** to **treat** the disordered **breathing**.

6/7/4 (Item 4 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0014261394 - Drawing available

WPI ACC NO: 2004-447713/200442

XPX Acc No: N2004-354052

**Implantable rate-responsive cardiac rhythm management device operating method, involves sensing physiological parameter with physiologic sensor, and enabling sleep apnea treatment when sensed parameter is within predefined range**

Patent Assignee: **CARDIAC PACEMAKERS INC (CARD-N)**

Inventor: **TERNES D J**

**Patent Family** (2 patents, 1 countries)

Patent Application

Number	Kind	Date	Number	Kind	Date	Update
US 20040098060	A1	20040520	US 2002295099	A	20021115	200442 B
US 7016730	B2	20060321	US 2002295099	A	20021115	200621 E

Priority Applications (no., kind, date): US 2002295099 A 20021115

**Patent Details**

Number Kind Lan Pg Dwg Filing Notes



US 20040098060 A1 EN 15 10

**Alerting Abstract US A1**

NOVELTY - The method involves implanting a **cardiac** rhythm management device in a patient. A physiologic sensor senses a physiological parameter that varies in relation to a level of patients physical activity. The sensed physiologic parameter is determined whether it is within a predefined range or not. A **sleep apnea treatment** of the rhythm management device is enabled when the sensed parameter is within the predefined range.

USE - Used for operating an implantable rate-responsive **cardiac** rhythm management device that provides **electrical stimulation** to the **heart**.

ADVANTAGE - The method conserves power and extends the life of a battery in the **cardiac** rhythm management device by enabling **sleep apnea treatment** based on the patient activity obtained from the physiologic sensors.

DESCRIPTION OF DRAWINGS - The drawing shows a plot of a patient activity versus time of low levels of activity of single activity sensor and for higher levels of activity multiple sensors.

**Class Codes**

International Classification (Main): A61N-001/365

International Classification (+ Attributes)

9/7/3 (Item 1 from file: 347)

DIALOG(R) File 347:JAPIO

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08317644 \*\*Image available\*\*

**SLEEP APNEA SYNDROME DIAGNOSING APPARATUS, SIGNAL ANALYZING APPARATUS, AND METHOD THEREOF**

PUB. NO.: 2005-065904 [JP 2005065904 A]

PUBLISHED: March 17, 2005 (20050317)

INVENTOR(s): ONO TAKAHIKO

YOKOTA NARUTOSHI

YANO HIROO

APPLICANT(s): SATO CORP

APPL. NO.: 2003-298401 [JP 2003298401]

FILED: August 22, 2003 (20030822)

**ABSTRACT**

PROBLEM TO BE SOLVED: To provide an apparatus for diagnosing **sleep apnea** syndrome.

SOLUTION: The **snoring** sound associated with breaths is collected, and waveforms are sequentially cut out in a time window of a **length** corresponding a **cycle** of the breaths of an ordinary person. Further, the interrelationship between the waveforms of **snoring** sounds of one **cycle** and next one **cycle** is sequentially calculated. In the case that the **snoring** sounds are constantly repeated according to the **cycle** of the breath, the value of the obtained interrelationship undergoes a transition while exhibiting the value very close to 1. On the other hand, when low breath or **apnea** starts and the **snoring** sound becomes not constant, at the time the value of the interrelationship is suddenly reduced. Accordingly, it becomes possible to constantly grasp the change in the **snoring** sound with the value of the interrelationship using a **sleep apnea** syndrome diagnosing apparatus.

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19/26, TI/22 (Item 22 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0012458732

WPI ACC NO: 2002-404670/

**Systolic/mean pulmonary artery pressure estimation for pulmonary hypertension treatment , involves determining pressure using predetermined regressive function relating normalized splitting interval and pressure**  
**Original Titles:**

METHOD AND APPARATUS FOR ESTIMATING PULMONARY ARTERY PRESSURE

Method and apparatus for estimating systolic and mean pulmonary artery pressures of a patient.

19/7/1 (Item 1 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0015324791 - Drawing available

WPI ACC NO: 2005-675040/200569

Related WPI Acc No: 2005-701072

XRAM Acc No: C2005-204821

XRPX Acc No: N2005-553669

**Collection of sleep quality information comprises monitoring physiological parameter, determining value of metric indicative of sleep quality, identifying current therapy parameter set, and associating metric value with parameter set**

Patent Assignee: HERUTH K T (HERU-I); MEDTRONIC INC (MEDT); MIESEL K A (MIES-I)

Inventor: HERUTH K J; HERUTH K T; MIESEL K A

Patent Family (2 patents, 107 countries)

Patent Application

Number	Kind	Date	Number	Kind	Date	Update
US 20050209513	A1	20050922	US 2004553783	P	20040316	200569 B
			US 2004826925	A	20040415	
WO 2005089649	A1	20050929	WO 2005US8801	A	20050316	200569 E

Priority Applications (no., kind, date): US 2004553783 P 20040316; US 2004826925 A 20040415

#### Patent Details

Number Kind Lan Pg Dwg Filing Notes

US 20050209513 A1 EN 28 11 Related to Provisional US 2004553783

WO 2005089649 A1 EN

National Designated States, Original: AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SM SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States, Original: AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IS IT KE LS LT LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW

#### Alerting Abstract US A1

NOVELTY - **Sleep** quality information is collected by monitoring physiological parameter of patient via medical device that delivers **therapy** to patient; determining value of metric indicative of **sleep** quality based on the parameter; identifying current **therapy** parameter set; and associating the metric value with the parameter set.

DESCRIPTION - INDEPENDENT CLAIMS are also included for:

- 1.a medical system (10) comprising a medical device (14) that delivers a **therapy** to a patient, and monitors physiological parameter of the patient based on a signal received from sensor; and processor (46) that determines the value of the metric indicative of **sleep** quality based on the physiological parameter, identifies a current **therapy** parameter set, and associates the **sleep** quality metric value with the current **therapy** parameter set;
- 2.a programming device comprising a telemetry circuit (50); a user interface including a display; and a processor that receives **sleep** quality metric values from a medical device via the telemetry circuit, and presents **sleep** quality information to a user via the display based on the **sleep** quality metric values; and
- 3.a computer-readable medium comprising instructions that cause a programmable processor to receive **sleep** quality metric values from the medical device; and present **sleep** quality information to the user via the display based on the **sleep** quality metric values.

USE - Used in collecting **sleep** quality information useful to provide improvement in course of **treatment** of ailment of the patient, such as chronic pain.

ADVANTAGE - The invention is capable of providing information related to the quality of patient's **sleep** to clinician and/or the patient. This can improve the course of **treatment** of an ailment of the patient, such as chronic pain. Using the **sleep** quality information provided by the system, the clinician and/or patient can, for example, make changes to the **therapy** provided by medical device in order to better address symptoms which are disturbing the patient's **sleep**. Further, a clinician may choose to prescribe a **therapy** that will improve the patient's **sleep**, such as a **sleep** inducing medication, in situations where poor **sleep** quality is increasing symptoms experienced by the patient.

DESCRIPTION OF DRAWINGS - The figure is a block diagram illustrating the inventive system and implantable medical device.

- 10 System
- 14 Implantable medical device
- 16ABC Leads
- 40AB Sensors
- 42A-H Electrodes
- 44 **Therapy** module
- 46 Processor
- 48 Memory
- 50 Telemetry
- Technology Focus**

INSTRUMENTATION AND TESTING - Preferred Properties: The physiological parameter comprises activity level, posture, **heart rate**, respiration rate, respiratory volume, and/or core temperature. It comprises blood pressure, blood oxygen saturation, partial pressure of oxygen within blood, partial pressure of oxygen within cerebrospinal fluid, muscular activity, arterial blood flow, melatonin level within a bodily fluid, and/or galvanic skin response. Preferred Methods: The **sleep** quality metric comprises **sleep** efficiency, and determining the value of the **sleep** quality metric comprises identifying when the patient is attempting to **sleep**; identifying when the patient is **asleep**; and determining a percentage of time that the patient is **asleep** while the patient is attempting to **sleep**. The **sleep** quality metric comprises **sleep** latency, and determining the value of the **sleep** quality metric comprises identifying a first time when the patient is attempting to fall **asleep**; identifying a second time when the patient falls **asleep**; and determining an amount of time between the first and second times.

Determining the value of the **sleep** quality metric comprises identifying when the patient is **asleep**; and determining an amount of time that the patient is **asleep** during a period. It comprises identifying number of arousal events and number of **apnea** events during period of **sleep**. It further comprises identifying when the patient is within a **sleep** state; and determining an amount of time that the patient was within the **sleep** state. It includes determining a value of each of the **sleep** quality metrics; and determining a value of an overall **sleep** quality metric based on the **sleep** quality metric values. Determining the value of the overall **sleep** quality metric comprises applying a weighting factor to the **sleep** quality metric values. The inventive method further involves presenting **sleep** quality information to a user by presenting a graphical representation of the **sleep** quality metric. The graph includes a trend diagram, a histogram, or a pie chart based on the values of the **sleep** quality metric. Presenting the **sleep** quality information to the user further comprises presenting a message related to **sleep** quality to the patient via a patient programmer. The inventive method further comprises determining values of the **sleep** quality metric over time; associating each of the determined values of the **sleep** quality metric with a current **therapy** parameter set; and for each of the **therapy** parameter sets, determining a representative value of the **sleep** quality metric based on the values of the **sleep** quality metric associated with the **therapy** parameter set. The representative value for each **therapy** parameter set comprises a mean value and/or a median value. The inventive method includes presenting a list of the **therapy** parameter sets and the associated representative values to the user; and ordering the list of **therapy** parameter sets according to the associated representative values. It involves determining values over time for each of the metrics that are indicative of **sleep** quality; associating each of the determined values with a current **therapy** parameter set; and for each of the **therapy** parameter sets, determining a representative value for each of the **sleep** quality metrics based on the values of that **sleep** quality metric associated with the **therapy** parameter set. Preferred Components: The medical device comprises an implantable medical device, preferably an implantable neuro **stimulator** and an implantable drug pump. The medical system further comprises a programming device to present **sleep** quality information to the user. The user comprises a clinician, and the programming device comprises a clinician programmer that presents the trend diagram, histogram, and/or pie chart to the clinician.

**Class Codes**

International Classification (Main): **A61B-005/11** , **A61N-001/00**  
(Additional/Secondary): **A61B-005/00** , **A61B-005/02** , **A61B-005/08** ,  
**A61N-001/05** , **A61N-001/365**

19/7/4 (Item 4 from file: 350)  
DIALOG(R) File 350:Derwent WPIX  
(c) 2006 The Thomson Corporation. All rts. reserv.  
0014966214 - Drawing available  
WPI ACC NO: 2005-314011/200532  
Related WPI Acc No: 2005-331573; 2005-394046; 2005-394050; 2005-394051;  
2005-394052; 2006-163446; 2006-181821; 2006-422840  
XRAM Acc No: C2005-097720  
XRPX Acc No: N2005-256639  
Device for managing respiration comprises responsive device coupled to electrode is configured to respond to information sensed by sensor to control electrical stimulation delivered to tissue through electrode

Patent Assignee: INSPIRATION MEDICAL INC (INSP-N); TEHRANI A J (TEHR-I)  
Inventor: LEE C; LIGON D; MELTZER M; MO A; TEHRANI A J

**Patent Family** (7 patents, 106 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20050085865	A1	20050421	US 2003686891	A	20031015	200532 B
WO 2005037366	A1	20050428	WO 2004US34103	A	20041015	200532 E
WO 2005037077	A2	20050428	WO 2004US34211	A	20041015	200532 E
WO 2005037172	A2	20050428	WO 2004US33850	A	20041015	200532 E
WO 2005037173	A2	20050428	WO 2004US34212	A	20041015	200532 E
WO 2005037174	A2	20050428	WO 2004US34213	A	20041015	200532 E
WO 2005037220	A2	20050428	WO 2004US34170	A	20041015	200532 E

Priority Applications (no., kind, date): US 2003686891 A 20031015

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
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US 20050085865	A1	EN	26	10		
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WO 2005037366	A1	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW

WO 2005037077	A2	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW

WO 2005037172	A2	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW

WO 2005037173	A2	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW

WO 2005037174	A2	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW

MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW  
WO 2005037220 A2 EN

National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI  
SK SL SZ TR TZ UG ZM ZW

**Alerting Abstract US A1**

NOVELTY - A respiration managing device comprises at least one electrode (61, 62) coupled to tissue to deliver **electrical stimulations** to tissue and to elicit a diaphragm respiratory response, a sensor to sense information corresponding to respiration, and a responsive device (100) coupled to electrode(s). The responsive device responds to information sensed by the sensor by controlling **electrical stimulation** delivered to the tissue through the electrode.

DESCRIPTION - AN INDEPENDENT CLAIM is included for controlling the respiration.

USE - The device is useful for managing respiration; and to detect and control occurrence of respiratory events such as **apnea**, hypoventilation and hyperventilation (claimed).

ADVANTAGE - The method and device provide **stimulation** to the diaphragm to elicit diaphragm movement to cause respiration when respiration ceases or falls below a threshold level. The device is self-management module. The system EMG memory is programmable to pre-trigger and post trigger **lengths** of storage for **sleep apnea** episodes.

DESCRIPTION OF DRAWINGS - The figure shows a processor unit of a **sleep breathing disorder treatment** device placed on the phrenic nerve.

60 **Sleep breathing disorder** apparatus  
61, 62 Electrode  
100 Control unit or responsive device  
140 External device.

**Technology Focus**

INSTRUMENTATION AND TESTING - The responsive device comprises a processor (105) and a telemetric device (106). The sensor is electromyogram (EMG) electrode configured to sense a diaphragm EMG; or an electrode configured to sense phrenic nerve activity.

**Class Codes**

International Classification (Main): **A61N-001/18**

International Classification (+ Attributes)

IPC + Level Value Position Status Version

A61N-0001/36 A I R 20060101

A61N-0001/36 C I R 20060101

19/7/5 (Item 5 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2006 The Thomson Corporation. All rts. reserv.  
0014946127 - Drawing available  
WPI ACC NO: 2005-293886/200530

Related WPI Acc No: 2004-775570; 2004-775573; 2004-784515; 2004-784516;  
2005-201771; 2005-211193; 2005-211722; 2005-221161; 2005-222940;  
2005-232358; 2005-232359; 2005-241209; 2005-252434; 2005-261232;  
2005-271829; 2005-284947; 2005-312586; 2005-312587; 2005-365896;  
2005-403165; 2006-340411

XRPX Acc No: N2005-241245

**Snoring detection method in patients suffering from sleep apnea ,  
involves detecting snoring based on signal modulated by snoring using  
processor in cardiac rhythm management device**

Patent Assignee: **CARDIAC PACEMAKERS INC (CARD-N)**

Inventor: **HARTLEY J W; HATLESTAD J D; LEE K; NI Q; SIEJKO K J; STAHMANN J E**

**Patent Family** (1 patents, 1 countries)

Patent	Application
Number	Kind Date Number Kind Date Update
US 20050065560	A1 20050324 US 2003504046 P 20030918 200530 B
	US 2004943071 A 20040915

Priority Applications (no., kind, date): US 2003504046 P 20030918; US  
2004943071 A 20040915

#### **Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20050065560	A1	EN	32	16	Related to Provisional US 2003504046	

**Alerting Abstract** US A1

NOVELTY - A signal modulated by **snoring** , is generated using a sensor in a lead system coupled to **cardiac** rhythm management device. The **snoring** is detected based on the **snoring** signal using processor in **cardiac** rhythm management device.

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

1. **sleep** disordered **breathing** detection method; and
2. system for detecting **snoring** in patient.

USE - For detecting **snoring** in patients suffering from **breathing disorder** such as **sleep apnea** , **hypopnea** , tachypnea, hyperpnea, dyspnea, periodic **breathing**, Cheyne-Stokes respiration (CSR), chronic **heart** failure using implantable transthoracic **cardiac** sensing and/or **stimulation** (ITCS) device.

ADVANTAGE - Enables to easily confirm presence of **sleep** disorder.

DESCRIPTION OF DRAWINGS - The figure shows the block diagram of the implantable system.

#### **Technology Focus**

INDUSTRIAL STANDARDS - The medical devices communicate through protocol that conforms to ~IEEE 802.11~ standards, and ~Bluetooth~ .

#### **Class Codes**

International Classification (Main): **A61N-001/40**

19/7/6 (Item 6 from file: 350)

DIALOG(R)File 350:Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.

0014937206 - Drawing available

WPI ACC NO: 2005-284947/200529

Related WPI Acc No: 2004-775570; 2004-775573; 2004-784515; 2004-784516;  
2005-201771; 2005-211193; 2005-211722; 2005-221161; 2005-222940;  
2005-232358; 2005-232359; 2005-241209; 2005-252434; 2005-261232;  
2005-271829; 2005-293886; 2005-312586; 2005-312587; 2005-365896;  
2005-403165; 2006-340411

XRPX Acc No: N2005-233772

**Patient monitoring, diagnosis and/or therapy system comprises implantable**

**and respiratory therapy devices which are configured to operate cooperatively through communication channel to provide patient monitoring, diagnosis and therapy**

Patent Assignee: **CARDIAC PACEMAKERS INC** (CARD-N); **HARTLEY J W** (HART-I); **LEE K** (LEEK-I); **NI Q** (NIQQ-I); **STAHMANN J E** (STAH-I)

Inventor: **HARTLEY J W**; **HATLESTAD J D**; **LEE K**; **NI Q**; **SIEJKO K J**; **STAHMANN J E**; **ZHU Q**; **HARTLEY J**; **HATLESTAD J**; **SIEJKO K**; **STAHMANN J**

**Patent Family** (10 patents, 107 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
WO 2005028029	A2	20050331	WO 2004US30787	A	20040917	200529 B
US 20050076905	A1	20050414	US 2003504356	P	20030918	200529 E
			US 2004922351	A	20040819	
US 20050076909	A1	20050414	US 2003504476	P	20030918	200529 E
			US 2004939586	A	20040913	
US 20050080461	A1	20050414	US 2003504709	P	20030918	200529 E
			US 2004939711	A	20040913	
US 20050080463	A1	20050414	US 2003504256	P	20030918	200529 E
			US 2004939639	A	20040913	
US 20050081847	A1	20050421	US 2003504381	P	20030918	200529 E
			US 2004922663	A	20040820	
US 20050113710	A1	20050526	US 2003504332	P	20030918	200535 E
			US 2004939834	A	20040913	
US 20050142070	A1	20050630	US 2003503808	P	20030918	200543 E
			US 2004943077	A	20040915	
US 20050145246	A1	20050707	US 2003504357	P	20030918	200546 E
			US 2004943079	A	20040915	
EP 1670547	A2	20060621	EP 2004784602	A	20040917	200643 E
			WO 2004US30787	A	20040917	

Priority Applications (no., kind, date): US 2003504357 P 20030918; US 2003503808 P 20030918; US 2003504332 P 20030918; US 2003504381 P 20030918; US 2003504476 P 20030918; US 2003504356 P 20030918; US 2003504256 P 20030918; US 2003504709 P 20030918; US 2004943079 A 20040915; US 2004943077 A 20040915; US 2004943074 A 20040915; US 2004943071 A 20040915; US 2004939834 A 20040913; US 2004939711 A 20040913; US 2004939639 A 20040913; US 2004939586 A 20040913; US 2004930979 A 20040831; US 2004930508 A 20040831; US 2004930346 A 20040831; US 2004929830 A 20040830; US 2004929826 A 20040830; US 2004929306 A 20040830; US 2004922663 A 20040820; US 2004922351 A 20040819; US 2004920675 A 20040817; US 2004920569 A 20040817; US 2004920568 A 20040817; US 2004864287 A 20040609; US 2004824941 A 20040415; US 2004824776 A 20040415; US 2004798794 A 20040311; US 2003504229 P 20030918; US 2004943070 A 20040915

#### Patent Details

Number	Kind	Lang	Pg	Dwg	Filing	Notes
WO 2005028029	A2	EN	590	116		

National Designated States, Original: AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States, Original: AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW

US 20050076905	A1	EN	Related to Provisional US 2003504356
US 20050076909	A1	EN	Related to Provisional US 2003504476
US 20050080461	A1	EN	Related to Provisional US 2003504709



US 20050080463 A1 EN Related to Provisional US 2003504256  
US 20050081847 A1 EN Related to Provisional US 2003504381  
US 20050113710 A1 EN Related to Provisional US 2003504332  
US 20050142070 A1 EN Related to Provisional US 2003503808  
US 20050145246 A1 EN Related to Provisional US 2003504357  
EP 1670547 A2 EN PCT Application WO 2004US30787

Based on OPI patent WO 2005028029

Regional Designated States, Original: AT BE BG CH CY CZ DE DK EE ES FI FR  
GB GR HU IE IT LI LU MC NL PL PT RO SE SI SK TR

**Alerting Abstract WO A2**

NOVELTY - A communication channel facilitates communication between implantable device and respiratory **therapy** device, which are configured to operate cooperatively through the communication channel to provided patient monitoring, diagnosis and **therapy**.

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

1. system for classifying disordered **breathing**;
2. system for providing disordered **breathing therapy** ;
3. medical system;
4. system for characterizing respiration of patient;
5. medical event logbook system;
6. respiratory event logbook system;
7. **sleep** logbook system;
8. system for detecting **snoring** in patient;
9. posture detection system;
10. medical system for controlling **therapy** for non-**breathing** rhythm related pulmonary disease;
11. medical **therapy** control system;
12. gas **therapy** system;
13. system for assessing disease presence;
14. system for detecting **sleep** related disorder; and
15. system for evaluating pathological conditions.

USE - For providing patient monitoring, diagnosis and/or **therapy** for **treating** pulmonary disease.

ADVANTAGE - Two or more of individual medical procedures is used in combination to provide more comprehensive patient monitoring, diagnosis and/or **therapy**.

DESCRIPTION OF DRAWINGS - The figure shows the block diagram of the system for providing coordinated monitoring, diagnosis and therapy.

**Class Codes**

International Classification (Main): A61B-005/08 , A61L-009/04,

A61M-015/00, A61M-016/00, A61N-001/20 , A61N-001/36

(Additional/Secondary): A61B-005/00 , A61B-005/04 , A61B-005/103 ,

A61K-009/22, A61M-031/00, A61N-001/18 , A61N-001/365 , A61N-001/362

International Classification (+ Attributes)

IPC + Level Value Position Status Version

A61N-0001/362 A I R 20060101

A61N-0001/362 A I F B 19850101

A61N-0001/362 C I R 20060101

19/7/7 (Item 7 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014912891 - Drawing available

WPI ACC NO: 2005-260560/200527

XRPX Acc No: N2005-213877

**Respiratory characteristic determining method for use in e.g. pacing therapy , involves finding respiratory characteristics based on atrioventricular conduction interval time, and discriminating obstructive and central sleep apneas**

Patent Assignee: BORNZIN G A (BORN-I); KOH S (KOH-S); PARK E (PARK-I)

Inventor: BORNZIN G A; KOH S; PARK E

**Patent Family** (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20050055060	A1	20050310	US 2003656540	A	20030905	200527 B

Priority Applications (no., kind, date): US 2003656540 A 20030905

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20050055060	A1	EN	23	12		

**Alerting Abstract** US A1

**NOVELTY** - The method involves delivering atrial pace such that the atrial pace controls over any intrinsic atrial activity. An atrioventricular conduction interval (AVI) time is determined based on the atrial pace and a corresponding sensed R wave. Respiratory characteristics are determined based on the AVI time. The characteristic indicates whether **sleep apnea** is determined to discriminate obstructive and central **sleep apneas**.

**DESCRIPTION** - **INDEPENDENT CLAIMS** are also included for the following:

1. an apparatus for determining respiratory characteristics
2. an implantable **cardiac stimulation** system comprising sensing circuitry to sense atrial and ventricular events and a processor to determine atrioventricular conduction interval times.

**USE** - Used for determining respiratory characteristics in a pacing **therapy** and a **cardiac related therapy** to **treat** fast and slow arrhythmias.

**ADVANTAGE** - The method allows the implantable **cardiac** devices to readily determine respiratory characteristics indirectly through electrocardiogram and/or other **cardiac** information.

**DESCRIPTION OF DRAWINGS** - The drawing shows a flow chart diagram of a method for determining respiratory characteristics.

**Class Codes**

International Classification (Main): **A61N-001/365**

US Classification, Issued: 607017000

19/7/10 (Item 10 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014601075 - Drawing available

WPI ACC NO: 2004-783041/

XRPX Acc No: N2004-617054

**Sleep apnea effects treating method, involves stimulating spinal cord of patient at predetermined location that reduces sympathetic nervous activity and/or increases parasympathetic nervous activity**

Patent Assignee: BURNES J E (BURN-I); HILL M R S (HILL-I); KING G W (KING-I); MEDTRONIC INC (MEDT); MIANULLI M J (MIAN-I); MULLEN T J (MULL-I); TESTERMAN R L (TEST-I); ZHOU X (ZHOU-I)

Inventor: BURNES J E; HILL M R S; KING G W; MIANULLI M J; MULLEN T J; TESTERMAN R L; ZHOU X

**Patent Family** (2 patents, 106 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
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US 20040210261 A1 20041021 US 2003419405 A 20030421 200477 B  
WO 2004093982 A1 20041104 WO 2004US11389 A 20040414 200477 E  
Priority Applications (no., kind, date): US 2003419405 A 20030421

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20040210261	A1	EN	17	6		
WO 2004093982	A1	EN				

National Designated States, Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States, Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PL PT RO SD SE SI SK  
SL SZ TR TZ UG ZM ZW

**Alerting Abstract US A1**

NOVELTY - The method involves **stimulating** the spinal cord of a patient at a predetermined location to modulate activity of an autonomic nervous system of the patient. The spinal cord is **stimulated** by delivering direct current and pulse train at a location that reduces sympathetic nervous activity and/or increases parasympathetic nervous activity. The cord is **stimulated** in response to determining that the patient is **asleep**.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a system for **treating** effects of **sleep apnea**.

USE - Used for **treating** the effects of **sleep apnea** in a patient that may lead to systemic hypertension, pulmonary hypertension, ischemic heart disease, stroke, and **cardiac** arrhythmias.

ADVANTAGE - The delivery of neurostimulation at predetermined locations decreases sympathetic nervous activity and/or increases parasympathetic nervous activity, thus countering increased intrinsic sympathetic activity associated with **apnea-arousal cycles**. The **stimulation** of particular region of the spinal cord reduces the sympathetic activity of nerves at that region, thereby reducing increase in **heart rate** and blood pressure that would result from an **apnea-arousal cycle**.

DESCRIPTION OF DRAWINGS - The drawing shows a block diagram of a system for **treating** effects of **sleep apnea**.

- 30 Processor
- 34 Parameter monitor
- 42 Telemetry
- 44 Memory
- 46 Posture/activity monitor

**Class Codes**

International Classification (Main): **A61N-001/34** , **A61N-001/362**  
(Additional/Secondary): **A61B-005/0205** , **A61N-001/36** , **A61N-001/372**

19/7/11 (Item 11 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014510671 - Drawing available

WPI ACC NO: 2004-692605/

XRPX Acc No: N2004-548874

**Implantable cardiac stimulation device for treating sleep apnea , controls generators that generate cardiac pacing pulses with timing, to drive at overdrive pacing rate based on intrinsic heart rate**

Patent Assignee: PACESETTER INC (PACE-N)

Inventor: BORNZIN G A; FALKENBERG E; LEVINE P A; PARK E

**Patent Family** (1 patents, 31 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
EP 1462146	A1	20040929	EP 2003251998	A	20030328	200468 B

Priority Applications (no., kind, date): EP 2003251998 A 20030328

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
EP 1462146	A1	EN	23	8		

Regional Designated States, Original: AL AT BE BG CH CY CZ DE DK EE ES FI  
FR GB GR HU IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR

**Alerting Abstract** EP A1

NOVELTY - The atrial and ventricular pulse generators generate **cardiac** pacing pulses with timing based on sensed intrinsic **cardiac** activity. A programmable processor controls the generators to drive at an overdrive pacing rate based on the intrinsic **heart rate**, in response to the detection of **sleep apnea** condition.

USE - For **treating sleep apnea** condition resulting due to blockage of air passage of nose and pharynx and due to neurological disfunction.

ADVANTAGE - Prevents **sleep apnea** condition by using timed **cardiac** pacing pulses.

DESCRIPTION OF DRAWINGS - The figure shows a functional block diagram of the implantable **cardiac stimulation** device.

**Class Codes**

International Classification (Main): **A61N-001/365**

**Claim:**

1. An implantable **cardiac stimulation** device comprising: a first sensor (582,584) that is capable of sensing intrinsic **cardiac** activity and generating corresponding signals; circuitry (560) that is connected to the sensor (582,584) to receive signals from the sensor, wherein the circuitry (560) is operative to process the signals to determine an intrinsic **heart rate**; a second sensor (518) that is capable of sensing a physiologic parameter; and one or more pulse generators (570,572) that are capable of generating **cardiac** pacing pulses to be delivered to the patient; a control circuit (560) that is responsive to detection of the potential **sleep apnea** condition to control the one or more pulse generators (570,522) to pace at an overdrive pacing rate based on the intrinsic **heart rate**.

19/7/12 (Item 12 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014493097 - Drawing available

WPI ACC NO: 2004-670558/200466

XRPX Acc No: N2004-531334

**Implantable cardiac device for non-physiologic pacing therapy , generates non-physiologic pacing pulses for delivery to patient's heart, based on episode of sleep apnea in heart**

Patent Assignee: FLORIO J J (FLOR-I); PACESETTER INC (PACE-N)

Inventor: FLORIO J J

**Patent Family** (2 patents, 34 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
EP 1459785	A1	20040922	EP 2004251565	A	20040318	200466 B
US 20040186523	A1	20040923	US 2003392128	A	20030318	200466 E

Priority Applications (no., kind, date): US 2003392128 A 20030318

**Patent Details**

Number Kind Lan Pg Dwg Filing Notes

EP 1459785 A1 EN 25 10

Regional Designated States, Original: AL AT BE BG CH CY CZ DE DK EE ES FI  
FR GB GR HR HU IE IT LI LT LU LV MC MK NL PL PT RO SE SI SK TR

**Alerting Abstract** EP A1

NOVELTY - A **sleep apnea** detector detects an episode of **sleep apnea** in patient's **heart**. A pulse generator generates non-physiologic pacing (NPP) pulses in response to detected episode of **sleep apnea**, for delivery to the patient's **heart**.

DESCRIPTION - An INDEPENDENT CLAIM is also included for implantable **cardiac stimulation** system.

USE - For monitoring **heart** activity and delivering **stimulation therapy** such as pacing **therapies** and non-physiologic pacing (NPP) **therapy** for **treating sleep apnea** in patient's **heart**.

ADVANTAGE - Reduces **heart** failure symptoms and reduces the **apnea** burden effectively.

DESCRIPTION OF DRAWINGS - The figure shows a schematic view of the implantable **cardiac** device.

100 implantable **cardiac** device

102 patient's **heart**

104 right atrial lead

106 coronary sinus lead

108 right ventricular lead

**Class Codes**

International Classification (Main): **A61N-001/36**, **A61N-001/365**

(Additional/Secondary): **A61N-001/368**

19/7/13 (Item 13 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014262573 - Drawing available

WPI ACC NO: 2004-448897/200442

XRPX Acc No: N2004-355171

**Sleep - disordered breathing e.g. apnea / hypopnea detecting method, involves determining whether patient is asleep using sensed sleep-rated signals and determining disordered breathing using signals associated with breathing**

Patent Assignee: **CARDIAC PACEMAKERS INC** (CARD-N); **HARTLEY J W** (HART-I);

**HATLESTAD J D** (HATL-I); **KIM J** (KIMJ-I); **LEE K** (LEEK-I); **NI Q** (NIQQ-I);

**STAHMANN J E** (STAH-I)

Inventor: **HARTLEY J W**; **HATLESTAD J D**; **KIM J**; **LEE K**; **NI Q**; **STAHMANN J E**

**Patent Family** (5 patents, 106 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20040111040	A1	20040610	US 2002309770	A	20021204	200442 B
WO 2004049930	A2	20040617	WO 2003US38438	A	20031204	200442 E
AU 2003293345	A1	20040623	AU 2003293345	A	20031204	200472 E
EP 1567051	A2	20050831	EP 2003790294	A	20031204	200561 E
			WO 2003US38438	A	20031204	
JP 2006508742	W	20060316	WO 2003US38438	A	20031204	200620 E
			JP 2004557545	A	20031204	

Priority Applications (no., kind, date): US 2002309770 A 20021204

**Patent Details**

Number Kind Lan Pg Dwg Filing Notes

US 20040111040 A1 EN 35 17

WO 2004049930 A2 EN

National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW  
MX MZ NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT  
TZ UA UG UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL  
SZ TR TZ UG ZM ZW

AU 2003293345 A1 EN Based on OPI patent WO 2004049930

EP 1567051 A2 EN PCT Application WO 2003US38438

Based on OPI patent WO 2004049930

Regional Designated States,Original: AL AT BE BG CH CY CZ DE DK EE ES FI  
FR GB GR HU IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR

JP 2006508742 W JA 37 PCT Application WO 2003US38438

Based on OPI patent WO 2004049930

**Alerting Abstract US A1**

NOVELTY - The method involves determining that a patient is **asleep**. A set of signals associated with **sleep - disordered breathing** is sensed while the patient is **asleep**. **Sleep - disordered breathing** is detected using the sensed signals. **Sleepiness** of the patient is determined using sensed multiple **sleep**-rated signals. One of the determining, sensing and detecting processes is performed in part implantably.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a **sleep - disordered breathing** detection device.

USE - Used in implantable **cardiac** rhythm management system, polysomnography device, respiratory monitor, **cardiac** monitor, and implantable or external **therapeutic** medical device e.g. continuous positive airway pressure device or hypoglossal nerve **stimulators** for detecting **sleep - disordered breathing** such as **sleep apnea / hypopnea** of a patient.

ADVANTAGE - The multiple **sleep**-rated signals used in determination of the patient **asleep** state accurately determine that the patient is **sleeping**. The method effectively determines the **sleep - disordered breathing**.

DESCRIPTION OF DRAWINGS - The drawing shows a block diagram of a **disordered breathing** detector.

100 **Disordered breathing** detection device

101 **Sleep** detection sensor

102 Threshold adjustment sensor

103 Confirmation sensor

104 **Disordered breathing** sensor

19/7/16 (Item 16 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0013584148 - Drawing available

WPI ACC NO: 2003-678838/

Related WPI Acc No: 2003-678835

XRPX Acc No: N2003-541962

Implantable cardiac stimulation device for treating sleep apnea , has circuitry to control pulse generators, and to adjust rest rate to sleep apnea prevention value when predetermined number of apnea episodes are detected

Patent Assignee: BORNZIN G A (BORN-I); KOH S (KOH-S-I); PARK E (PARK-I)

Inventor: BORNZIN G A; KOH S; PARK E

**Patent Family** (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20030153956	A1	20030814	US 200277048	A	20020214	200364 B
			US 2002247137	A	20020918	

Priority Applications (no., kind, date): US 200277048 A 20020214; US 2002247137 A 20020918

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20030153956	A1	EN	24	10	Continuation of application	US 200277048

**Alerting Abstract** US A1

NOVELTY - The device (100) has metabolic demand and activity sensors (102,103) for sensing respective parameters. A circuitry detects a rest condition of a patient based on the sensor signals and controls pulse generators (104) to pace at a rest rate that is set to an initial value. The circuitry adjusts the rest rate to a **sleep apnea** prevention value when a predetermined number of **sleep apnea** episodes are detected.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of operating an implantable **cardiac stimulation** device.

USE - Used for **treating sleep apnea**.

ADVANTAGE - The circuitry adjusts the rest rate of the patient to a **sleep apnea** prevention rate, thereby preventing **sleep apnea** effectively.

DESCRIPTION OF DRAWINGS - The drawing shows a schematic block diagram of an implantable **cardiac stimulation** device including physiologic sensors and pulse generators.

100 Implantable **cardiac stimulation** device

102 Metabolic demand sensor

103 Activity sensor

104 Pulse generators

**Class Codes**

International Classification (Main): **A61N-001/365**

19/7/17 (Item 17 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0013584147 - Drawing available

WPI ACC NO: 2003-678837/200364

XRPX Acc No: N2003-541961

**Implantable cardiac stimulation device for treating sleep apnea , has circuitry responding to potential sleep apnea condition to control pulse generators to pace heart at sleep prevention rate**

Patent Assignee: BORNZIN G A (BORN-I); KOH S (KOH-S-I); PACKSETTER INC (PACK-N); PARK E (PARK-I)

Inventor: BORNZIN G A; KOH S; PARK E

**Patent Family** (2 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20030153955	A1	20030814	US 200277660	A	20020214	200364 B
US 6999817	B2	20060214	US 200277660	A	20020214	200613 E

Priority Applications (no., kind, date): US 200277660 A 20020214

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20030153955	A1	EN	21	10		

**Alerting Abstract US A1**

NOVELTY - The device (100) has sensors (102) for sensing a physiologic parameter and generating corresponding signals. A circuitry connected to the sensor responds to a potential **sleep apnea** condition to control pulse generators (104) to pace the heart at a **sleep apnea** prevention rate. A controller includes an executable logic that distinguishes between a **sleeping** and a waking condition of a patient.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of operating an implantable **cardiac stimulation** device.

USE - Used for **treating sleep apnea**.

ADVANTAGE - The circuitry controls the pulse generators to pace at a **sleep apnea** prevention rate, thereby preventing **sleep apnea** effectively.

DESCRIPTION OF DRAWINGS - The drawing shows a schematic block diagram of an implantable **cardiac stimulation** device including physiologic sensors and pulse generators.

100 Implantable **cardiac stimulation** device

102 Physiologic sensors

104 Pulse generators

**Class Codes**

International Classification (Main): **A61N-001/365**

International Classification (+ Attributes)

IPC + Level Value Position Status Version

**A61N-0001/36 A I F B 20060101**

19/7/19 (Item 19 from file: 350)

DIALOG(R)File 350:Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.

0013584145 - Drawing available

WPI ACC NO: 2003-678835/200364

Related WPI Acc No: 2003-678838

XRPX Acc No: N2003-541959

**Implantable cardiac stimulation device for treating sleep apnea ,  
has circuitry responding to detection of potential sleep apnea  
condition to control pulse generators according to sleep apnea  
prevention pacing mode**

Patent Assignee: BORNZIN G A (BORN-I); KOH S (KOH-S-I); PACESETTER INC  
(PACE-N); PARK E (PARK-I)

Inventor: BORNZIN G A; KOH S; PARK E

**Patent Family** (2 patents, 1 countries)

Patent Application

Number	Kind	Date	Number	Kind	Date	Update
US 20030153953	A1	20030814	US 200277048	A	20020214	200364 B
US 6928324	B2	20050809	US 200277048	A	20020214	200552 E

Priority Applications (no., kind, date): US 200277048 A 20020214

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20030153953	A1	EN	27	11		

**Alerting Abstract US A1**

NOVELTY - The device (100) has metabolic demand and activity sensors (102,103) for sensing parameters indicative of a body's metabolic demand and physical activity, respectively. A circuitry processes the signals from the sensors and responds to detection of a potential **sleep apnea** condition. The circuitry controls pulse generators (104) that generate **cardiac** pacing pulses according to a **sleep apnea** prevention pacing



mode.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of operating an implantable **cardiac stimulation** device.

USE - Used for **treating sleep apnea**.

ADVANTAGE - The **stimulation** device elevates the pacing rate to prevent or terminate **sleep apnea** by increasing the **cardiac** output. Increased **cardiac** output increases blood oxygen concentration while decreasing carbon dioxide concentration.

DESCRIPTION OF DRAWINGS - The drawing shows a schematic block diagram of an implantable **stimulation** device.

100 Implantable **cardiac stimulation** device

102 Metabolic demand sensor

103 Activity sensor

104 Pulse generators

**Class Codes**

International Classification (Main): **A61N-001/365**

19/7/21 (Item 21 from file: 350)

DIALOG(R)File 350:Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.

0012823089 - Drawing available

WPI ACC NO: 2002-680777/200273

XRPX Acc No: N2002-537277

**Body functions measurement method used for sleep apnea diagnosis, involves modeling ECG-derived respiratory signal by interpolation between consecutive values of angle of mean electrical axis at QRS pulse locations**

Patent Assignee: UNIV TEXAS SYSTEM (TEXA)

Inventor: BEBEHANI K; BURK J R; LUCAS E A

**Patent Family** (1 patents, 1 countries)

Patent			Application			Update
Number	Kind	Date	Number	Kind	Date	
US 6415174	B1	20020702	US 1998107564	P	19981109	200273 B
			US 1999434503	A	19991105	

Priority Applications (no., kind, date): US 1998107564 P 19981109; US 1999434503 A 19991105

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 6415174	B1	EN	15	8	Related to Provisional	US 1998107564

**Alerting Abstract** US B1

NOVELTY - An area of QRS pulses is calculated from ECG signal values measured in a patient's body. An angle of the depolarization wave's mean **electrical axis** (MEA) is calculated based on the area of the QRS pulses. An EDR signal is modeled by interpolation between consecutive values of the angle of mean **electrical axis** at the QRS pulse locations.

USE - For diagnosing **sleep disordered breathing** such as **sleep apnea** and **sleep hypopnea**.

ADVANTAGE - Significantly reduces the incidence of misdiagnosis of arrhythmias caused by respiratory function, thereby avoiding expensive and inappropriate **treatment** such as implanting a **heart** pace-maker. Provides the cardiologist with necessary information to discriminate between arrhythmias associated with disordered **breathing** and those associated with intrinsic **cardiac** malfunction.

DESCRIPTION OF DRAWINGS - The figure shows a flowchart illustrating process of deriving respiratory rhythms from ECG signals.

**Class Codes**

International Classification (Main): **A61B-005/0402**

**19/7/23 (Item 23 from file: 350)**

DIALOG(R)File 350:Derwent WPIX

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0011104166 - Drawing available

WPI ACC NO: 2002-040047/200205

Related WPI Acc No: 2001-540182

XRPX Acc No: N2002-029592

**Obstructive sleep apnea treatment system provides electrical stimuli to innervated muscle in co-ordination with sensed respiratory effort of patient**

Patent Assignee: MEDTRONIC INC (MEDT)

Inventor: MICHELS K J; OTTENHOFF F A M

**Patent Family** (1 patents, 1 countries)

Patent			Application		
Number	Kind	Date	Number	Kind	Date Update
US 6269269	B1	20010731	US 199864729	A	19980423 200205 B
			US 1999411844	A	19991004

Priority Applications (no., kind, date): US 199864729 A 19980423; US 1999411844 A 19991004

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 6269269	B1	EN	10	6	C-I-P of application	US 199864729

**Alerting Abstract** US B1

NOVELTY - An implant able pulse generator **electrically stimulates** a nerve in **upper airway** tract continuously over a certain period to elicit contraction by an innervated muscle, after determining that the patient (2) has entered **sleep** state. Respiratory effort sensor delivers high frequency current between electrodes (11,12) placed on opposite sides of diaphragm for measuring impedance there between and thereby respiratory effort. **Stimulation** is provided in coordination with sensed respiratory effort.

DESCRIPTION - An INDEPENDENT CLAIM is also included for implant able pulse generator.

USE - For patients with obstructive **sleep apnea** (OS).

ADVANTAGE - The **stimulator** e.g. pulse generator waits for a predetermined period of time which permits the device to operate only when the patient is **asleep**, thereby permits delivery of stimuli to be precisely controlled by actual respiratory effort of the system. Due to synchronized **treatment** of OS, pulmonary and systematic hypertension, **cardiac** arrhythmia, myocardia, infarction and **cardiac** failure due to OSA are also **treated**.

DESCRIPTION OF DRAWINGS - The figure shows obstructive **sleep apnea treatment** system implanted in a patient.

2 Patient

11,12 Electrodes

**Class Codes**

International Classification (Main): **A61N-001/00**

**19/7/24 (Item 24 from file: 350)**

DIALOG(R)File 350:Derwent WPIX

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0010947572 - Drawing available

WPI ACC NO: 2001-570346/200164

XRPX Acc No: N2001-425078

**Diaphragmatic pacing method for treating breathing disorders to maintain respiration rate at 10-50 breaths per minute**

Patent Assignee: **CARDIAC** PACEMAKERS INC (CARD-N)

Inventor: KADHIRESAN V; SCHEINER A

**Patent Family** (3 patents, 23 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
WO 2001041868	A1	20010614	WO 2000US33177	A	20001207	200164 B
AU 200119521	A	20010618	AU 200119521	A	20001207	200164 E
US 6415183	B1	20020702	US 1999456879	A	19991209	200248 E

Priority Applications (no., kind, date): US 1999456879 A 19991209

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
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WO 2001041868	A1	EN	34	10		
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National Designated States, Original: AU CA JP

Regional Designated States, Original: AT BE CH CY DE DK ES FI FR GB GR IE  
IT LU MC NL PT SE TR

AU 200119521 A EN Based on OPI patent WO 2001041868

**Alerting Abstract** WO A1

NOVELTY - A pacing lead is located in or near a patient's **heart** so that the electrode on the lead is situated to deliver an **electric** stimulus to the patient's phrenic nerve when the need for it is determined by a controller.

DESCRIPTION - A physiological state information, such as respiration activity, or minute ventilation, is sensed by implanted lead (120), which is a bipolar pacing lead having a tip electrode (121) and ring electrode (122), both of which are disposed within a superior vena cava (110) of the **heart** (101). The tip electrode and ring electrodes are used for sensing respiratory activity by e.g. minute ventilation and for delivering diaphragm **electric** stimulus to the phrenic nerve (102).

USE - For performing diaphragmatic pacing, for **treating** respiratory ailments such as **sleep apnea**.

ADVANTAGE - System provides for sensing a physiological state of the patient related to respiration effort using an electrode implanted in the **heart**. Provides diaphragmatic pacing using advanced, developed technology provided by modern **cardiac** pacing lead technology, and provides phrenic pacing without invasive surgery associated with attaching nerve cuffs.

DESCRIPTION OF DRAWINGS - Drawing shows an embodiment of a diaphragmatic pacing system and an environment in which it is used.

101 **Heart**

102 Phrenic nerve

110 Superior vena cava

120 Implanted lead

121 Tip electrode

122 Ring electrode.

**Class Codes**

International Classification (Main): **A61N-001/36**

(Additional/Secondary): **A61N-001/368**

19/7/25 (Item 25 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0010918541 - Drawing available

WPI ACC NO: 2001-540182/

Related WPI Acc No: 2002-040047

XRPX Acc No: N2001-401364

**Body implantable pulse generator for treating obstructive sleep apnea, controls electrical stimulation to nerve in upper airway tract based on sensed respiratory effort**

Patent Assignee: MEDTRONIC INC (MEDT)

Inventor: MICHELS K J; OTTENHOFF F A M

**Patent Family** (1 patents, 1 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 6251126	B1	20010626	US 199864729	A	19980423	200160 B
			US 1999411845	A	19991004	

Priority Applications (no., kind, date): US 199864729 A 19980423; US 1999411845 A 19991004

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 6251126	B1	EN	11	6	Continuation of application	US 199864729

**Alerting Abstract** US B1

NOVELTY - Electric stimulator stimulates nerve in upper airway tract to elicit contraction by innervated muscle, for preset period after patient (2) enters sleep state. A controller controls stimulation based on respiratory effort, sensed by respiratory effort sensor that has two electrodes (11,12) for impedance measurement on opposite sides of diaphragm (13).

DESCRIPTION - An INDEPENDENT CLAIM is also included for obstructive sleep apnea treating method.

USE - Body implantable pulse generator for treatment of obstructive sleep apnea of patient.

ADVANTAGE - By controlling stimulation based on respiratory effort, problem of cardiac artifacts are solved.

DESCRIPTION OF DRAWINGS - The figures show the sectional view of patient with electrodes across diaphragm.

2Patient

11,12Electrodes

13Diaphragm

**Class Codes**

International Classification (Main): A61N-001/00

19/7/26 (Item 26 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0010081185 - Drawing available

WPI ACC NO: 2000-387642/200033

XRPX Acc No: N2000-290209

**Intra-oral electromuscular stimulation device used for treating patient suffering from breathing trouble has electrodes provided at sub-lingual location posterior to frenulum, which are respectively supported**

Patent Assignee: RESIRONICS INC (RESI-N); RESPIRONICS INC (RESP-N)

Inventor: LATNER S; MECHLENBURG D; MECHLENBURG D M; SCARBERRY E N; STARR E W

**Patent Family** (8 patents, 23 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
WO 2000029063	A1	20000525	WO 1999US26987	A	19991112	200033 B
AU 200020245	A	20000605	AU 200020245	A	19991112	200042 E
US 6212435	B1	20010403	US 1998108408	P	19981113	200120 E

EP 1128868	A1	20010905	US 1999436857	A	19991109	
			EP 1999963902	A	19991112	200151 E
			WO 1999US26987	A	19991112	
US 20030069626	A1	20030410	US 1998108408	P	19981113	200327 E
			US 1999436857	A	19991109	
			US 2001817434	A	20010326	
US 6618627	B2	20030909	US 1998108408	P	19981113	200361 E
			US 1999436857	A	19991109	
			US 2001817434	A	20010326	
US 20040019368	A1	20040129	US 1998108408	P	19981113	200413 E
			US 1999436857	A	19991109	
			US 2001817434	A	20010326	
			US 2003623328	A	20030718	
CA 2477540	A1	20000525	CA 2350209	A	19991112	200503 E
			CA 2477540	A	19991112	

Priority Applications (no., kind, date): US 2003623328 A 20030718; US 2001817434 A 20010326; US 1998108408 P 19981113; US 1999436857 A 19991109

#### Patent Details

Number	Kind	Lan	Pg	Dwg	Filing	Notes
WO 2000029063	A1	EN	67	9		
National Designated States,Original: AU CA JP						
Regional Designated States,Original: AT BE CH CY DE DK ES FI FR GB GR IE						
IT LU MC NL PT SE						
AU 200020245	A	EN				Based on OPI patent WO 2000029063
US 6212435	B1	EN				Related to Provisional US 1998108408
EP 1128868	A1	EN				PCT Application WO 1999US26987
Based on OPI patent WO 2000029063						
Regional Designated States,Original: AT BE CH CY DE DK ES FI FR GB GR IE						
IT LI LU MC NL PT SE						
US 20030069626	A1	EN				Related to Provisional US 1998108408
Continuation of application US 1999436857						
Continuation of patent US 6212435						
US 6618627	B2	EN				Related to Provisional US 1998108408
Continuation of application US 1999436857						
Continuation of patent US 6212435						
US 20040019368	A1	EN				Related to Provisional US 1998108408
Continuation of application US 1999436857						
Division of application US 2001817434						
Continuation of patent US 6212435						
Division of patent US 6618627						
CA 2477540	A1	EN				Division of application CA 2350209

#### Alerting Abstract WO A1

NOVELTY - The **stimulation** device (30) has an electrode (36) positioned in sub-lingual location posterior to frenulum and near to the three molar of patient. The electrode (38) is provided at sub-lingual position posterior to the electrode (36). The electrodes are supported by support units.

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- 1.intra-oral electromuscular **stimulation** method;
- 2.intra-oral electrode **stimulation** system

USE - For providing non-invasive intra-oral electromuscular **stimulation** to patient to **treat breathing** trouble e.g. obstructive **sleep apnea** causing day time **sleepiness**, **cardiac** arrhythmias, pulmonary artery hypertension, congestive **heart** failure, and/or cognitive dysfunction, ventricular dysfunction, carbon dioxide retention during wakefulness, continuous reduced arterial oxygen tension.

ADVANTAGE - By providing intra-oral **electrical stimulation** to a

patient, airway closure is reduced to minimize **breathing** trouble. The device applies **stimulation** to the patient at appropriate time, duration, location and energy levels during inspiratory phase to induce muscle contraction sufficiently without causing pain to patient.

DESCRIPTION OF DRAWINGS - The figure shows the schematic drawing of electro-muscular **stimulation** system.

30 **Stimulation** device

36, 38 Electrodes

**Class Codes**

International Classification (Main): **A61N-001/02** , **A61N-001/04** ,  
**A61N-001/05** , **A61N-001/18**

(Additional/Secondary): **A61N-001/08** , **A61N-001/36**

19/7/27 (Item 27 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0009800065 - Drawing available

WPI ACC NO: 2000-089444/200008

XRPX Acc No: N2000-070426

**Treatment of apnea during sleep by heart stimulation**

Patent Assignee: ELA MEDICAL SA (ELAM-N)

Inventor: BONNET J; BONNET J L

**Patent Family** (9 patents, 27 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
EP 970713	A1	20000112	EP 1999401683	A	19990706	200008 B
FR 2780654	A1	20000107	FR 19988639	A	19980706	200010 E
WO 2000001438	A1	20000113	WO 1999IB1345	A	19990705	200011 E
JP 2002519161	W	20020702	WO 1999IB1345	A	19990705	200246 E
			JP 2000557882	A	19990705	
US 6574507	B1	20030603	WO 1999IB1345	A	19990705	200339 E
			US 2000508068	A	20000306	
JP 3621348	B2	20050216	WO 1999IB1345	A	19990705	200513 E
			JP 2000557882	A	19990705	
EP 970713	B1	20050928	EP 1999401683	A	19990706	200564 E
DE 69927438	E	20060209	DE 69927438	A	19990706	200617 E
			EP 1999401683	A	19990706	
DE 69927438	T2	20060622	DE 69927438	A	19990706	200643 E
			EP 1999401683	A	19990706	

Priority Applications (no., kind, date): EP 1999401683 A 19990706; FR 19988639 A 19980706

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
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EP 970713	A1	FR	8	2		
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Regional Designated States,Original: AL AT BE CH CY DE DK ES FI FR GB GR  
IE IT LI LT LU LV MC MK NL PT RO SE SI

WO 2000001438	A1	EN				
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National Designated States,Original: JP US

JP 2002519161	W	JA	14			PCT Application WO 1999IB1345 Based on OPI patent WO 2000001438
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US 6574507	B1	EN				PCT Application WO 1999IB1345 Based on OPI patent WO 2000001438
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JP 3621348	B2	JA	6			PCT Application WO 1999IB1345 Previously issued patent JP 2002519161 Based on OPI patent WO 2000001438
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EP 970713                    B1 FR  
Regional Designated States, Original: AT BE CH CY DE DK ES FI FR GB GR IE  
IT LI LU MC NL PT SE  
DE 69927438                E DE                    Application EP 1999401683  
Based on OPI patent EP 970713  
DE 69927438                T2 DE                    Application EP 1999401683  
Based on OPI patent EP 970713

**Alerting Abstract EP A1**

NOVELTY - Electrodes in the thoracic cage determine a normal **breathing** rate (T) by impedance measurements and are then able to detect the onset of **apnea** from an increased value for (T). If the number of instances of **apnea** in a preset time exceeds a threshold and this occurs during **sleeping** as established from the **breathing** characteristic or other means the rate of **heart** activity is increased by an implanted element

USE - To counter the effects of **apnea** during **sleep**.

ADVANTAGE - The **treatment** does not involve **stimulation** of the airway muscles and may be very easily be applied to patients who already have pacemakers

DESCRIPTION OF DRAWINGS - The drawing shows the normal respiration of a patient during **sleep**

T Period of normal respiration during **sleep**

VE Ventilation signal

**Class Codes**

International Classification (Main): A61M-016/00, **A61N-001/365**

(Additional/Secondary): A61F-005/56, **A61N-001/36**

International Classification (+ Attributes)

IPC + Level Value Position Status Version

A61M-0016/00 A I F 20060101  
A61N-0001/36 A I L 20060101  
A61M-0016/00 A I R 20060101  
A61M-0016/00 A I F B 20060101  
A61N-0001/36 A I R 20060101  
A61N-0001/36 A I L B 20060101  
A61N-0001/365 A N R 20060101  
A61M-0016/00 C I R 20060101  
A61N-0001/36 C I R 20060101  
A61N-0001/365 C N R 20060101

Claim: I claim:

- 1.1. A **cardiac stimulation** device for **treating** the syndrome of the **sleep apnea** of a patient by **electrostimulation** comprising:
  - \* means for measuring the respiratory activity of the patient having an output signal representative of the patient's respiratory activity;
  - \* means for analyzing the patient's respiratory activity according to the output signal from the respiratory measuring means to determine an occurrence of an **apnea**;
  - \* means for determining a **cardiac** rate of the patient, including a second rate in the absence of a determined **apnea**;
  - \* means for **stimulation**, controlled by the analyzing means, to apply selectively to the patient **cardiac** stimuli at a first rate in the event of a detection of an **apnea**, said first rate being higher than the second rate;
  - \* means for determining a state of activity of the patient, said state being selected, according to predetermined criteria, from among a first value representative of a **sleep** state of the patient and a second value representative of an awake state of the patient;
  - \* wherein the **stimulation** means is applying to the patient **cardiac**

stimuli at the first **cardiac** rate only during a determined **sleep** phase.

21/7/2 (Item 2 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0014893466 - Drawing available

WPI ACC NO: 2005-241209/200525

Related WPI Acc No: 2005-201771; 2005-211193; 2005-211722; 2005-221161;  
2005-222940; 2005-232358; 2005-232359; 2005-252434; 2005-261232;  
2005-271829; 2005-284947; 2005-293886; 2005-312586; 2005-312587;  
2005-365896; 2005-403165; 2006-340411

XRAM Acc No: C2005-076835

XRPX Acc No: N2005-198829

Controlling sleep disordered breathing therapy for e.g. heart failure patient, involves monitoring patient(s) conditions using monitoring device, and developing and providing feedback information

Patent Assignee: HARTLEY J W (HART-I); LEE K (LEEK-I); NI Q (NIQQ-I);

STAHMANN J E (STAH-I)

Inventor: HARTLEY J W; LEE K; NI Q; STAHMANN J E

Patent Family (1 patents, 1 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20050061315	A1	20050324	US 2003504071	P	20030918	200525 B
			US 2004864287	A	20040609	

Priority Applications (no., kind, date): US 2003504071 P 20030918; US 2004864287 A 20040609

#### Patent Details

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20050061315	A1	EN	56	24	Related to Provisional	US 2003504071

#### Alerting Abstract US A1

NOVELTY - Controlling **sleep disordered breathing** therapy comprises monitoring patient(s) conditions using monitoring device with circuitry within an implantable housing, developing feedback information for controlling **sleep disordered breathing** therapy based on the monitored condition(s), and providing feedback information to device delivering **therapy to treat sleep disordered breathing** .

DESCRIPTION - Controlling **sleep disordered breathing** therapy comprises monitoring patient(s) conditions using monitoring device with circuitry within an implantable housing, developing feedback information for controlling **sleep disordered breathing** therapy based on the monitored condition(s), and providing feedback information to device delivering **therapy to treat sleep disordered breathing** . A housing of **therapy device** is separate from the implantable housing of monitoring device.

An INDEPENDENT CLAIM is included for medical system comprising monitoring unit with component in implantable housing, and processor. The monitoring unit is made to monitor patient condition(s). The processor is coupled to the monitoring unit and is made to provide feedback information related to **sleep disordered breathing** therapy delivered to patient based on monitored conditions. The components of **therapy device** delivering the disordered **breathing** therapy are disposed in **therapy device** housing. The **therapy device** housing is separate from implantable housing of monitoring device.

USE - For controlling **sleep disordered breathing** therapy for e.g.



**heart failure patient.**

**ADVANTAGE** - The invention enhances **therapy** delivery.

**DESCRIPTION OF DRAWINGS** - The figure shows a block diagram of the medical system.

**Technology Focus**

**INSTRUMENTATION AND TESTING - Preferred Methods:** The monitoring of patient condition(s) comprises monitoring physiological conditions, respiration pattern, respiration system, cardiovascular system, monitoring cardiopulmonary, **heart rate**, nervous system conditions, blood pressure conditions, non-physiological conditions, contextual conditions, or environmental condition. The monitoring patient(s) comprises storing information associated with patient condition(s). The developing of feedback information comprises detecting **sleep** based on the monitored conditions, developing feedback information based on detection of **sleep**, detecting **therapy** interactions based on monitored condition(s), developing feedback information based on **therapy** effectiveness, determining impact of the **therapy** on patient based on monitored conditions, and developing feedback information based on **therapy** impact. The monitoring of patient condition(s) comprises detecting **sleep disordered breathing** events based on patient condition(s), determining characteristics of **sleep disordered breathing** events, and developing the feedback information comprising developing the feedback information based on the characteristics of the **sleep disordered breathing** events.

The determining characteristics of **sleep disordered breathing** events comprise determining duration of **sleep disordered breathing** events or frequency of **sleep disordered breathing** events, and calculation **disordered breathing** index or **apnea/hyperpnoea** index. The determining of feedback information comprises determining trends of monitored condition(s), and developing feedback information based on the trends. The method includes transmitting information associated with monitored conditions from monitoring device to separate medical device other than the **therapy** device. The developing of feedback information based on monitored conditions comprises developing feedback information using separate medical device. The transmitting information associated with monitored conditions from monitoring device to separate medical device and transmitting feedback information from the separate medical device to the **therapy** device is performed wirelessly.

The providing of feedback information comprises developing the feedback information using monitoring device, and providing feedback information to **therapy** device comprising transmitting the feedback information from monitoring device to **therapy** device. The providing of feedback information to device delivering **therapy** to treat the **sleep disordered breathing** comprises providing feedback information to nerve **stimulation** device delivering nerve **stimulation therapy** to treat the **sleep disordered breathing**, and adjusting **sleep disordered breathing therapy** using feedback information comprising adjusting the nerve **stimulation therapy**. The adjusting **sleep disordered breathing therapy** using feedback information comprises adjusting the drug **therapy**.

**Preferred Components:** The monitoring unit monitors physiological conditions, respiration pattern, respiration system, cardiovascular system, monitoring cardiopulmonary, **heart rate**, blood chemistry, nervous system conditions, blood pressure conditions, non-physiological conditions, contextual conditions, or environmental condition. The monitoring unit includes memory for storing information associated with patient condition(s), and **sleep** detector, **disordered breathing** detector. The system includes **therapy** device with components in housing separated from the

implantable housing of monitoring device, transmitter, nerve or muscle stimulation device, drug therapy device, patient-external breathing therapy device, and cardiac stimulation device.

**Class Codes**

International Classification (Main): A61M-015/00  
(Additional/Secondary): A61M-016/00

21/7/4 (Item 4 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0013497012 - Drawing available

WPI ACC NO: 2003-589470/200356

XRPX Acc No: N2003-469216

**Medical device for discriminating between sleeping and waking phases has means for monitoring patient breathing and comparing an average breathing signal with thresholds for sleeping and waking phases**

Patent Assignee: ELA MEDICAL SA (ELAM-N); LIMOUSIN M (LIMO-I); POEZEVERA Y (POEZ-I)

Inventor: LIMOUSIN M; POEZEVERA Y

**Patent Family** (7 patents, 31 countries)

Patent Number	Kind	Date	Application Number	Kind	Date	Update
EP 1317943	A1	20030611	EP 2002293017	A	20021206	200356 B
FR 2833177	A1	20030613	FR 200115867	A	20011207	200356 E
US 20030163059	A1	20030828	US 2002310689	A	20021205	200357 E
US 6773404	B2	20040810	US 2002310689	A	20021205	200453 E
EP 1317943	B1	20050316	EP 2002293017	A	20021206	200522 E
DE 60203246	E	20050421	DE 60203246	A	20021206	200528 E
			EP 2002293017	A	20021206	
DE 60203246	T2	20060209	DE 60203246	A	20021206	200611 E
			EP 2002293017	A	20021206	

Priority Applications (no., kind, date): EP 2002293017 A 20021206; FR 200115867 A 20011207

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
EP 1317943	A1	FR	10	1		
Regional Designated States, Original: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR						
EP 1317943	B1	FR				
Regional Designated States, Original: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LU MC NL PT SE SI SK TR						
DE 60203246	E	DE				Application EP 2002293017 Based on OPI patent EP 1317943
DE 60203246	T2	DE				Application EP 2002293017 Based on OPI patent EP 1317943

**Alerting Abstract** EP A1

NOVELTY - Device in which a **breathing** signal is monitored to determine when a patient is awake or **asleep**. Accordingly means are provided for monitoring patient **breathing** and delivering a corresponding signal. The signal is averaged and compared with threshold values corresponding to **sleeping** and waking states. **Sleeping** and waking states are recorded.

DESCRIPTION - The inventive device can be used in monitoring **sleep** disorders, such as **apnea** and can also be used with a pacemaker type device with means for **stimulating** the **heart** according to whether a **sleeping** or waking state is detected.

USE - Medical device for discriminating between **sleeping** and waking phases.

ADVANTAGE - The inventive device enables rapid detection of **sleeping** and waking phases.

DESCRIPTION OF DRAWINGS - (Drawing includes non-English language text). Figure illustrates **sleeping** and waking phases determined from a **breathing** signal.

MV **breathing** signal  
temps time.

**Class Codes**

International Classification (Main): A61B-005/08, A61N-001/365

(Additional/Secondary): A61B-005/00, A61B-005/103, A61B-005/117,  
A61N-001/36, A61N-001/37

International Classification (+ Attributes)

IPC + Level Value Position Status Version

A61N-0001/36 A I L 20060101

A61N-0001/365 A I F 20060101

Claim: We claim:

1.

**\*\*1\*\***. An active medical, device, comprising:

- \* (a) means for measuring a physiological parameter of a patient and delivering a physiological signal;
- \* (b) means for detecting an awakening phase and a **sleep** phase of the patient, including: a first comparator means for computing an average value of the measured physiological signal over a first period, and comparing said average with a predetermined physiological threshold; and
- \* (c) means for indicating a first state of the patient as an awakening state in response to the average being greater than said physiological threshold, and as a **sleep** state otherwise;
- \* (d) means for measuring an activity parameter of the patient and producing a physical signal corresponding to said activity parameter;
- \* (e) second comparator means for comparing the measured physical signal with a predetermined activity threshold; and
- \* (f) means for indicating a second state of the patient as an awakening state in response to said activity signal being greater than said activity threshold, and as a **sleep** state otherwise;
- \* (g) means for comparing the first state of the patient with the second state of the patient; and
- \* (h) anticipating means for selectively modifying the period of said first comparator means in response to a discordance between the aforementioned first and second states of awakening or **sleep**.

21/7/5 (Item 5 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0013332333 - Drawing available

WPI ACC NO: 2003-419749/200339

XRPX Acc No: N2003-335128

**Sleep apnea detecting apparatus, has computer loaded with predetermined algorithm that calculates RR interval of acquired electrocardiogram signal to provide diagnostic measure of apnea**

Patent Assignee: UNIV COLLEGE DUBLIN (UYDU-N); BIANCAMED LTD (BIAN-N)

Inventor: CHAZAL P D; HENEGHAN C; SHERIDAN E; DE CHAZAL P

**Patent Family** (2 patents, 1 countries)

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20030055348	A1	20030320	US 2001952688	A	20010914	200339 B
US 7025729	B2	20060411	US 2001952688	A	20010914	200627 E

Priority Applications (no., kind, date): US 2001952688 A 20010914

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20030055348	A1	EN	20	9		

**Alerting Abstract** US A1

NOVELTY - The apparatus has a signal processing device that filters out unwanted interference present in the acquired electrocardiogram (ECG) signal. A computer loaded with predetermined algorithm calculates the RR time intervals of the processed ECG signal and ECG derived respiratory signal to produce an output indicative of diagnostic measure of **apnea**.

DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of obtaining a diagnostic measure of **sleep apnea**.

USE - Used for detecting **sleep apnea**.

ADVANTAGE - The apparatus provides an efficient and accurate measurement of **sleep apnea**.

DESCRIPTION OF DRAWINGS - The drawing shows a flowchart depicting the steps involved in the method of obtaining diagnostic measure of **sleep apnea**.

**Class Codes**

International Classification (Main): A61B-005/04

International Classification (+ Attributes)

IPC + Level Value Position Status Version

A61B-0005/0402 A I F B 20060101

File 350:Derwent WPIX 1963-2006/UD=200647

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File 349:PCT FULLTEXT 1979-2006/UB=20060727,UT=20060720

(c) 2006 WIPO/Univentio

File 348:EUROPEAN PATENTS 1978-2006/ 200630

(c) 2006 European Patent Office

Set	Items	Description
S1	1484	AU='CHO Y' OR AU='CHO Y K' OR AU='CHO Y K 249 1204 HWANGGOL MAEUL SSANGYONG APT'
S2	24	AU='CHO YONG'
S3	77	AU='CHO YONG K':AU='CHO YONG KYUN'
S4	99	AU='MARKOWITZ H' OR AU='MARKOWITZ H T' OR AU='MARKOWITZ H - TOBY':AU='MARKOWITZ HAROLD T'
S5	3	AU='MARKOWITZ HAROLD T 2536 149TH AVENUE N E ANOKA':AU='MA- RKOWITZ HARRY'
S6	10661	SDB OR SLEEP()DISORDER?? OR APNEA OR APNIA OR HYPOPN?A
S7	33	S1:S5 AND S6
S8	207908	STIMULAT?
S9	22	S7 AND S8
S10	2129840	ELECTRIC?
S11	20	S9 AND S10
S12	20	IDPAT (sorted in duplicate/non-duplicate order)
S13	20	IDPAT (primary/non-duplicate records only)
S14	2	S9 NOT S11
S15	11	S7 NOT S9

13/TI/3 (Item 3 from file: 350)

DIALOG(R)File 350:(c) 2006 The Thomson Corporation. All rts. reserv.  
**Patient disordered breathing e.g. cheyne-stokes breathing, detecting method, involves monitoring patient physiologic characteristic by activity sensor to give output relative to cyclical characteristics variation during breathing**

13/TI/6 (Item 6 from file: 350)

DIALOG(R)File 350:(c) 2006 The Thomson Corporation. All rts. reserv.  
**System for treatment of obstructive sleep apnea - employs highly accurate detection technique accomplished by measuring electrical activity associated with contraction of diaphragm and pressure within thorax and upper air way**

13/TI/11 (Item 11 from file: 349)

DIALOG(R)File 349:(c) 2006 WIPO/Univentio. All rts. reserv.  
**IMPLANTABLE MEDICAL DEVICE WITH SLEEP DISORDERED BREATHING MONITORING**

13/TI/12 (Item 12 from file: 349)

DIALOG(R)File 349:(c) 2006 WIPO/Univentio. All rts. reserv.  
**METHOD AND APPARATUS FOR MODIFYING DELIVERY OF A THERAPY IN RESPONSE TO ONSET OF SLEEP**

13/TI/16 (Item 16 from file: 349)

DIALOG(R)File 349:(c) 2006 WIPO/Univentio. All rts. reserv.  
**METHOD AND DEVICE FOR DETECTING RESPIRATORY DISTURBANCES**

13/TI/20 (Item 20 from file: 349)

DIALOG(R)File 349:(c) 2006 WIPO/Univentio. All rts. reserv.  
**METHOD AND APPARATUS FOR MONITORING HEART RATE AND ABNORMAL RESPIRATION**

13/3,AB,IC/1 (Item 1 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0014996462

WPI ACC NO: 2005-344346/200535

XRPX Acc No: N2005-281306

**Implantable medical device e.g. implantable cardioverter defibrillator, for delivering augmentation therapy e.g. post-extra systolic potentiation, has stimulation module to deliver therapy if sleep - disordered breathing is detected**

Patent Assignee: CHO Y K (CHOY-I); MARKOWITZ H T (MARK-I); MEDTRONIC INC (MEDT)

Inventor: CHO Y K ; MARKOWITZ H T ; MARKOWITZ T H

2 patents, 106 countries

**Patent Family**

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20050090871	A1	20050428	US 2003693375	A	20031024	200535 B
WO 2005042088	A1	20050512	WO 2004US34845	A	20041021	200535 E

Priority Applications (no., kind, date): US 2003693375 A 20031024

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20050090871	A1	EN	23	10		
WO 2005042088	A1	EN				

National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States,Original: AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW

**Alerting Abstract US A1**

NOVELTY - The device has a sensor to monitor a parameter indicative of **sleep - disordered** breathing. A detection module coupled to the sensor detects the presence of the breathing based on the parameter. A **stimulation** module delivers augmentation therapy in a form of **electrical stimulation** to cardiac tissue if the **sleep - disordered** breathing is detected. Stroke volume and ventricular pressure are increased when the therapy is delivered.

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- 1.a method of utilizing an implantable medical device to provide therapy for **sleep - disordered** breathing
- 2.a computer readable medium containing instructions to cause an implantable medical device to perform actions to provide therapy for **sleep disordered** breathing.

USE - Implantable medical device e.g. implantable cardioverter defibrillator and pacemaker, for delivering augmentation therapy e.g. post-extra systolic potentiation (PESP) and non-excitatory **stimulation** /cardiac contractility modulation (NES/CCM), for **sleep - disordered** breathing e.g. central sleep **apnea** and obstructive sleep **apnea** .

**ADVANTAGE** - The utilization of the augmentation therapy prevents the dramatic shifts above and below threshold values for the sensed oxygen in the blood and effectively stabilizes the carbon dioxide and oxygen in the blood, thus greatly reducing the **sleep - disordered** breathing, and hence reducing the frequency of obstructive sleep **apnea** .

**DESCRIPTION OF DRAWINGS** - The drawing shows a flow chart illustrating a process of detecting **sleep - disordered** breathing and delivering augmentation therapy.

**Class Codes**

International Classification (Main): A61N-001/36, A61N-001/365

(Additional/Secondary): A61B-005/08

**Original Publication Data by Authority**

**Original Abstracts:**

An implantable medical device delivers augmentation therapy to intervene in a pattern of **sleep - disordered** breathing. Augmentation therapy includes the delivery of **electrical stimulation** to cardiac tissue above and/or below a capture threshold. PESP and NES/CCM are possible augmentation therapies that are used alone or in combination. In addition, augmentation therapies can be used with other pacing therapies such as atrial overdrive pacing and atrial coordinated pacing as a therapy for **sleep - disordered** breathing.

**13/3,AB,IC/2** (Item 2 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0014380990

WPI ACC NO: 2004-570034/200455

XRPX Acc No: N2004-450800

**Sleep-related disordered breathing monitoring system, has sensor for generating output signal and cardiac pacemaker that provides electrical stimulation therapy and reducing disordered breathing episode**

Patent Assignee: CHO Y K (CHOY-I); ERICKSON M K (ERIC-I); MARKOWITZ H T (MARK-I); MEDTRONIC INC (MEDT)

Inventor: **CHO Y K** ; ERICKSON M K; **MARKOWITZ H T**

4 patents, 107 countries

**Patent Family**

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20040138719	A1	20040715	US 2003439184	P	20030110	200455 B
			US 2003419465	A	20030421	
WO 2004062724	A1	20040729	WO 2004US672	A	20040109	200455 E
EP 1583583	A1	20051012	EP 2004701264	A	20040109	200567 E
			WO 2004US672	A	20040109	
US 7025730	B2	20060411	US 2003419465	A	20030421	200626 E

Priority Applications (no., kind, date): US 2003439184 P 20030110; US 2003419465 A 20030421

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
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US 20040138719	A1	EN	18	7	Related to Provisional	US 2003439184
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WO 2004062724	A1	EN				
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National Designated States,Original: AE AG AL AM AT AU AZ BA BB BG BR BW  
BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR  
HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW

MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR  
TT TZ UA UG US UZ VC VN YU ZA ZM ZW  
Regional Designated States, Original: AT BE BG BW CH CY CZ DE DK EA EE ES  
FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL  
SZ TR TZ UG ZM ZW  
EP 1583583 A1 EN PCT Application WO 2004US672

Based on OPI patent WO 2004062724

Regional Designated States, Original: AL AT BE BG CH CY CZ DE DK EE ES FI  
FR GB GR HU IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR

**Alerting Abstract US A1**

NOVELTY - The system has a monitoring system with a patient mask (6) having a sensor unit (5) for generating an output signal relating to respiration. A controller (8) receives the signal and detects a disordered breathing event. A cardiac pacemaker (10) gives an **electrical stimulation** therapy and reduces episodes of disordered breathing. The sensor is connected to an interface (7) through a telemetric or radio frequency link.

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- 1.a method for monitoring and treating sleep-related disordered breathing
- 2.a hybrid apparatus for detecting sleep disordered breathing episode and providing a therapy to reduce the episode comprising an implantable medical device apparatus telemetrically coupled to an external continuous positive airway pressure (CPAP) apparatus
- 3.a computer readable medium for performing a method using a computer that executes instructions through a hybrid apparatus for detecting sleep disordered breathing episode and providing a therapy to reduce the episode comprising an implantable medical device apparatus telemetrically coupled to an external CPAP apparatus.

USE - Used for monitoring a sleep related breathing disorder such as e.g. sleep apnea and cheyne-stokes breathing, and delivering a therapeutic intervention.

ADVANTAGE - The cardiac pacemaker effectively delivers the **electrical stimulation** therapy and reduces the number of episodes of sleep-related disordered breathing throughout the remainder of the patient's sleep without causing patient arousals or discomfort, thereby improving the patient compliance. The sensor is connected to the interface through the telemetric or radio frequency communication link, and hence there is no need for an air hose, thereby reducing the inconvenience of wearing mask during sleep.

DESCRIPTION OF DRAWINGS - The drawing shows a schematic diagram of a system for monitoring sleep related disordered breathing and delivering a therapeutic intervention.

- 1 Sleep-related disordered breathing monitoring system
- 2A External monitoring system
- 3 Positive airway source
- 4 Air hose
- 5 Sensors
- 6 Patient mask
- 7 Sensor interface
- 8 Controller
- 10 Cardiac pace maker



**Class Codes**

International Classification (Main): A61N-001/36  
International Classification (+ Attributes)  
IPC + Level Value Position Status Version  
A61B-0005/08 A I F B 20060101

**Original Publication Data by Authority**

**Original Abstracts:**

The invention relates generally to a system and method for monitoring and automatically delivering a therapy for sleep-related disordered breathing. In one form the present invention relates to an external device for monitoring for sleep-related disordered breathing in communication with an implantable medical device for delivering an **electrical stimulation** therapy. In another form the present invention relates to an implantable medical device for detecting sleep-related disordered breathing episode(s) and an external apparatus (e.g., a CPAP machine) for providing therapy to terminate, and/or reduce, said episode(s). In this form of the invention, the implantable medical device communicates with the external apparatus so that the therapy provided corresponds in magnitude and duration to the severity and/or length of the episode(s). In yet another form, an implantable apparatus detects said disordered breathing episode(s) and a hybrid therapy is provided by both the implantable apparatus and an external apparatus.

**13/3,AB,IC/4 (Item 4 from file: 350)**

DIALOG(R) File 350:Derwent WPIX

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0013799770

WPI ACC NO: 2003-899849/200382

XRPX Acc No: N2003-718273

**Sleep apnea treatment apparatus e.g. biventricular pacemaker outputs sleep apnea interruption pulse, through electrode of lead extending from control unit, to stimulate phrenic nerve and diaphragm**

Patent Assignee: BURNES J E (BURN-I); CHO Y K (CHOY-I); MEDTRONIC INC (MEDT)

Inventor: BURNES J E; CHO Y K

4 patents, 30 countries

**Patent Family**

Patent			Application			
Number	Kind	Date	Number	Kind	Date	Update
US 20030195571	A1	20031016	US 2002121323	A	20020412	200382 B
WO 2003086531	A2	20031023	WO 2003US11202	A	20030410	200382 E
EP 1542764	A2	20050622	EP 2003718349	A	20030410	200541 E
			WO 2003US11202	A	20030410	
JP 2005537819	W	20051215	JP 2003583540	A	20030410	200582 E
			WO 2003US11202	A	20030410	

Priority Applications (no., kind, date): US 2002121323 A 20020412

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20030195571	A1	EN	12	6		

WO 2003086531 A2 EN  
National Designated States,Original: CA JP  
Regional Designated States,Original: AT BE BG CH CY CZ DE DK EE ES FI FR  
GB GR HU IE IT LU MC NL PT RO SE SI SK TR  
EP 1542764 A2 EN PCT Application WO 2003US11202  
Based on OPI patent WO 2003086531  
Regional Designated States,Original: AT BE BG CH CY CZ DE DK EE ES FI FR  
GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR  
JP 2005537819 W JA 20 PCT Application WO 2003US11202  
Based on OPI patent WO 2003086531

**Alerting Abstract US A1**

NOVELTY - A lead (106) that extends from a control unit (102), has an electrode (116) **electrically** coupled with a control unit. The lead is implanted in a blood vessel such as cardiac vein (126). The control unit outputs a sleep **apnea** interruption pulse, through the conductor and electrode, to **stimulate** one of the phrenic nerve and diaphragm.

DESCRIPTION - An INDEPENDENT CLAIM is also included for sleep **apnea** treatment method.

USE - For treating sleeping **apnea** using biventricular pacemaker.

ADVANTAGE - Enables prevention of **hypopnea** during sleep **apnea**, by **stimulating** the phrenic nerve with implanted cardiac leads. The device is easily implantable and less invasive.

DESCRIPTION OF DRAWINGS - The figure shows a schematic view of the sleep **apnea** treating device.

- 100 implantable medical device
- 102 control unit
- 106 lead
- 116 electrode
- 126 cardiac vein

**Class Codes**

International Classification (Main): A61N, A61N-001/36, A61N-001/365

**Original Publication Data by Authority**

**Original Abstracts:**

An apparatus and method for treating sleep **apnea** includes control unit in **electrical** communication with a lead. The control unit is capable of outputting a sleep **apnea** interruption pulse to **stimulate** at least one of a phrenic nerve and a diaphragm. Specifically, an implanted medical device (IMD) such as an implantable cardioverter-defibrillator (ICD) or a pacemaker paces the heart and a mode switch algorithm changes the pacing output to **stimulate** at least one of a phrenic nerve and diaphragm when sleep **apnea** is detected by the control unit. The method includes determining if the patient is experiencing sleep **apnea** and outputting a sleep **apnea** interruption pulse to the at least one of a phrenic nerve and a diaphragm. The control unit may be incorporated with the IMD. In another embodiment, the control unit may be in wireless communication with the IMD and positioned outside a patient's body.

13/3,AB,IC/5 (Item 5 from file: 350)  
DIALOG(R) File 350:Derwent WPIX  
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0006474888

WPI ACC NO: 1993-280270/199335

XRFX Acc No: N1993-215322

**Body implantable stimulation lead for treatment of obstructive sleep apnea - comprises scored thin sheet of flexible biocompatible material with conductors of conductive ink attached to substrate using silk screening, folded to enclose conductors along length**

Patent Assignee: MEDTRONIC INC (MEDT)

Inventor: **MARKOWITZ H T**

1 patents, 1 countries

**Patent Family**

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 5238006	A	19930824	US 1991719929	A	19910624	199335 B

Priority Applications (no., kind, date): US 1991719929 A 19910624

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 5238006	A	EN	11	8		

**Alerting Abstract US A**

The **stimulation lead** for **electrically** coupling an implantable pulse generator to an electrode in an apnoea treatment system includes a thin substrate of polyurethane or other highly flexible implantable material. Conductors are placed on the substrate by silk screening a conductive ink.

The ends of the lead are **electrically** terminated using rivets which couple through the substrate. The substrate is folded to enclose the conductors, thereby insulating them and protecting them from bodily fluids. Suitable connectors may be attached to either end. The lead is easily fabricated and is extremely thin and flexible.

USE/ADVANTAGE - Implantable application where coiled conductor construction is not required, improved flex strength.

**Class Codes**

International Classification (Main): A61N-001/00

13/3,AB,IC/7 (Item 7 from file: 350)

DIALOG(R)File 350:Derwent WPIX

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0006094049

WPI ACC NO: 1992-333797/199241

XRFX Acc No: N1992-254792

**Implantable appts. for treatment of obstructive sleep apnea - detects onset by differential pressure measurement to generate synchronised muscle stimulations of gradually increasing intensity**

Patent Assignee: MEDTRONIC INC (MEDT)

Inventor: KALLOK M; KALLOK M J; **MARKOWITZ H T** ; MARKOWITZ T

4 patents, 4 countries

**Patent Family**

Patent Number	Kind	Date	Application Number	Kind	Date	Update
EP 507580	A2	19921007	EP 1992302899	A	19920402	199241 B
US 5215082	A	19930601	US 1991679120	A	19910402	199323 E
EP 507580	B1	19960731	EP 1992302899	A	19920402	199635 E
DE 69212520	E	19960905	DE 69212520	A	19920402	199641 E

EP 1992302899      A    19920402

Priority Applications (no., kind, date): US 1991679120 A 19910402

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
EP 507580	A2	EN	9	5		
Regional Designated States,Original: DE FR GB NL						
US 5215082	A	EN	8	5		
EP 507580	B1	EN	10	5		
Regional Designated States,Original: DE FR GB NL						
DE 69212520	E	DE				Application EP 1992302899
						Based on OPI patent EP 507580

**Alerting Abstract EP A2**

The onset of an **apnea** event is determined by measuring the pressure differential between the thorax and the upper airway, with a pair of pressure sensors. When an event is detected, a generating circuit produces a **stimulation** signal in response. The amplitude of the signal may be varied from a minimum level at the beginning of the **stimulation**.

The generation of the signal is synchronised to an inspiration cycle via an electrode for sensing diaphragm contractions. The signal is coupled to the muscles to be **stimulated** by an electrode with an insulated lead.

ADVANTAGE - System has minimum cogrizable effect upon a patient with reduced amount of **stimulation** energy employed.

**Equivalent Alerting Abstract US A**

The implantable **apnea** generator having a ramp-on generator includes a device which determines the onset of an **apnea** event comprising a sensor for measuring a pressure difference between the thorax and the upper airway. The generator coupled to the determiner generates a **stimulation** signal in response to the **apnea** event.

An adjuster coupled to the generator varies the amplitude of the **stimulation** signal from a min. intensity to a max. intensity. The generator includes a synchronising device for matching the **stimulation** signal with an inspiration cycle.

USE/ADVANTAGE - For treating obstructive sleep **apnea** by **stimulation** of muscles of upper airway, without disturbing patient.

**Class Codes**

International Classification (Main): A61N-001/08, A61N-001/36

**Original Publication Data by Authority**

**Original Abstracts:**

An implantable system for the treatment of obstructive sleep **apnea** by **electrical stimulation** of the musculature of the upper airway. The system employs one or more sensors (44, 46) to determine the onset of an **apnea** event. Upon sensing of the onset of an **apnea** event, the **stimulation** generator (144, 150, 152, 154, 156) provides a signal for **stimulating** the muscles of the upper airway at a varying intensity controlled by a control means (142, 160, 154) wherein the intensity is gradually increased during the course of the **stimulation**. The signal is coupled to the muscles to be **stimulated** by an electrode connected to the **stimulation** generator by an insulated lead (52).

13/3,AB,IC/8 (Item 8 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0006079248

WPI ACC NO: 1992-318073/199239

XRPX Acc No: N1992-243462

**Implantable medical device for sensing central and obstructive sleep apnea events - has implanted sensors which cause stimulation of patients diaphragm and upper airway musculature**

Patent Assignee: MEDTRONIC INC (MEDT)

Inventor: KALLOCK M; KALLOK M; KALLOK M J; **MARKOWITZ H T** ; MARKOWITZ T

8 patents, 5 countries

**Patent Family**

Patent Number	Kind	Date	Application Number	Kind	Date	Update
EP 505195	A2	19920923	EP 1992302397	A	19920319	199239 B
US 5146918	A	19920915	US 1991671513	A	19910319	199240 E
AU 199210808	A	19920924	AU 199210808	A	19920207	199246 E
CA 2062171	A	19920920	CA 2062171	A	19920302	199250 E
EP 505195	A3	19930203	EP 1992302397	A	19920319	199347 E
AU 646320	B	19940217	AU 199210808	A	19920207	199412 E
EP 505195	B1	19971105	EP 1992302397	A	19920319	199749 E
DE 69222965	E	19971211	DE 69222965	A	19920319	199804 E
			EP 1992302397	A	19920319	

Priority Applications (no., kind, date): US 1991671513 A 19910319

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
EP 505195	A2	EN	18	12		
Regional Designated States,Original: DE FR GB NL						
US 5146918	A	EN	17	12		
CA 2062171	A	EN				
EP 505195	A3	EN				
AU 646320	B	EN				Previously issued patent AU 9210808
EP 505195	B1	EN	20	12		
Regional Designated States,Original: DE FR GB NL						
DE 69222965	E	DE				Application EP 1992302397
						Based on OPI patent EP 505195

**Alerting Abstract EP A2**

A single implantable system detects and remedially responds to central sleep **apnea** and obstructive **apnea** . Central **apnea** is preferably detected by a combination of different sensor types, e.g. detecting absence of respiratory effort for a given period of time or falling blood oxygen.

Obstructive **apnea** is detected by measuring the pressure difference across the upper airway during inspiration using implanted pressure sensors (42, 48). **Stimulation** from an implanted pulse generator (20) is applied appropriately to the diaphragm (18) or the musculature of the upper airway (12).

**ADVANTAGE** - **Stimulation** energy does not have to be large and effect of **stimulation** not directly cognisable by patient.

**Equivalent Alerting Abstract US A**

The control appts. comprises an implantable sensor to detect a central **apnea** event and a device responsibly coupled to the first sensor provides **stimulation** to the diaphragm of a patient in response to sensing a central **apnea** event. A second sensor coupled to the first sensor detects an obstructive **apnea** event by sensing an abnormal pressure differential across the airway. A second device coupled to the second sensor generates **electrical stimulation** of muscles of the patient in response to sensing an obstructive **apnea** event.

The sensors may each further comprise a pressure sensor and/or a threshold circuit. The first sensor may also include a reflectance oximeter for measuring blood oxygen.

USE/ADVANTAGE - For treatment of sleep **apnea** . Treats both central and obstructive **apnea** and monitoring allows **stimulation** to be adapted as appropriate.

#### Class Codes

International Classification (Main): A61H-031/00, A61N-001/00, A61N-001/36

#### Original Publication Data by Authority

#### Original Abstracts:

An apparatus for the control of both central and obstructive sleep **apnea** using **electrical stimulation** on a demand basis. Implantable sensors (44,46) monitor the respiration cycle and determine the occurrence of **apnea** events. Sensing means (76,92,82) sense central **apnea** by the passage of an escape interval of time without the sensing of an inspiratory event. Obstructive sleep **apnea** is sensed by a sensing means (78) as an abnormal pressure differential across the airway. The diaphragm is **electrically stimulated** by a **stimulating** means (98,104,54) upon sensing of central **apnea** . The musculature of the upper airway is **electrically stimulated** by a **stimulating** means (100,102,52) upon sensing of an occurrence of obstructive sleep **apnea** . **Stimulation** of the upper airway is provided whenever central **apnea** is sensed.

13/3,AB,IC/17 (Item 17 from file: 349)

DIALOG(R) File 349:PCT FULLTEXT

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01064771

**IMPLANTABLE APNEA MONITOR**

**PROCEDE ET APPAREIL PERMETTANT DE DETECTER ET DE SURVEILLER LA FREQUENCE DE L'APNEE OBSTRUCTIVE**

Patent Applicant/Assignee:

MEDTRONIC INC, MS LC340, 710 Medtronic Parkway NE, Minneapolis, MN 55432,  
US, US (Residence), US (Nationality)

Inventor(s):

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Legal Representative:

WOLDE-MICHAEL Girma (et al) (agent), MS LC340, 710 Medtronic Parkway NE,  
Minneapolis, MN 55432, US,

Patent and Priority Information (Country, Number, Date):

Patent: WO 200392493 A2-A3 20031113 (WO 0392493)

Application: WO 2003US10052 20030402 (PCT/WO US03010052)

Priority Application: US 2002136778 20020430  
Designated States:  
(Protection type is "patent" unless otherwise stated - for applications prior to 2004)  
CA JP  
(EP) AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL PT RO SE  
SI SK TR  
Main International Patent Class (v7): A61B-005/04  
Publication Language: English  
Filing Language: English  
Fulltext Word Count: 5225  
English Abstract

The present invention provides a method and apparatus for detecting and monitoring obstructive sleep **apnea**. The apparatus includes an intracardiac impedance sensor to measure intracardiac impedance, a movement sensor to measure an amount of movement of a patient, and a controller operatively coupled to said intracardiac impedance sensor and said movement sensor, said controller adapted to receive at least one of an intracardiac impedance and the amount of movement of the patient and detect obstructive sleep **apnea** based upon said intracardiac impedance and said movement.

13/3,AB,IC/19 (Item 19 from file: 349)  
DIALOG(R) File 349:PCT FULLTEXT  
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00953741  
**METHOD AND APPARATUS TO DETECT AND TREAT SLEEP RESPIRATORY EVENTS**  
**METHODE ET APPAREIL DE DETECTION ET DE TRAITEMENT D'EVENEMENTS RESPIRATOIRES PENDANT LE SOMMEIL**  
Patent Applicant/Assignee:  
MEDTRONIC INC, LC 340, 710 Medtronic Parkway, Minneapolis, MN 55432, US,  
US (Residence), US (Nationality)  
Inventor(s):  
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ERICKSON Mark K, 9208 Victoria Court, Brooklyn Park, MN 55443, US,  
MARKOWITZ H Toby , 1670 Ridgewood Lane South, Roseville, MN 55113, US,  
Legal Representative:  
SOLDNER Michael C (et al) (agent), 710 Medtronic Parkway NE, Minneapolis,  
MN 55432-5601, US,  
Patent and Priority Information (Country, Number, Date):  
Patent: WO 200287433 A1 20021107 (WO 0287433)  
Application: WO 2002US13505 20020429 (PCT/WO US0213505)  
Priority Application: US 2001287650 20010430  
Designated States:  
(Protection type is "patent" unless otherwise stated - for applications prior to 2004)  
CA JP  
(EP) AT BE CH CY DE DK ES FI FR GB GR HU IE IT LU MC NL PT SE TR  
Main International Patent Class (v7): A61B-005/0205  
International Patent Class (v7): A61B-005/08  
Publication Language: English  
Filing Language: English  
Fulltext Word Count: 6674  
English Abstract

The present invention provides a method and apparatus for detecting and treating sleep respiratory events that includes a plurality of sensors gathering physiological data related to sleep respiratory events. A processor extracts an average cycle length and a frequency of at least one of Cheyne-Stokes respiration and periodic breathing based upon the physiological data, and determines whether therapy is required based on the average cycle length and the frequency.

14/26,TI/1 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
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0006459787

WPI ACC NO: 1993-264205/199333

**Obstructive sleep apnea screening appts. for pre-operative and intra-operative screening - processes signals from sensors adapted to monitor different physiological parameters and generates muscle stimulating signal in response to detection of apnea event**

**Original Titles:**

Method and apparatus for apnea patient screening

15/26,TI/1 (Item 1 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2006 The Thomson Corporation. All rts. reserv.  
0015730630

WPI ACC NO: 2006-292520/200630

**Obstructive sleep apnea detecting and monitoring method, involves measuring amount of movement of patient, and determining presence of apnea based upon change in intracardiac impedance and movement of patient**

**Original Titles:**

Method and apparatus to detect and monitor the frequency of obstructive sleep apnea

15/26,TI/3 (Item 3 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2006 The Thomson Corporation. All rts. reserv.  
0015183958

WPI ACC NO: 2005-533550/200554

**Implantable medical device e.g. implantable cardioverter defibrillator for diagnosis of sleep disordered breathing, evaluates sensed physical parameter in specific manner based on patient posture indicating sleeping or waking state**

**Original Titles:**

IMPLANTABLE MEDICAL DEVICE WITH SLEEP DISORDERED BREATHING MONITORING

15/26,TI/4 (Item 4 from file: 350)  
DIALOG(R)File 350:Derwent WPIX  
(c) 2006 The Thomson Corporation. All rts. reserv.  
0015162308

WPI ACC NO: 2005-511890/200552

**Implantable medical device e.g. implantable cardioverter defibrillator, for monitoring sleep disordered breathing, has microprocessor determining whether parameter is indicative of breathing based on selected posture and criteria**

**Original Titles:**



Implantable medical device with **sleep disordered** breathing monitoring

15/26, TI/5 (Item 5 from file: 350)

DIALOG(R) File 350: Derwent WPIX

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0014372806

WPI ACC NO: 2004-561701/200454

**Respiratory disturbance e.g. kussmaul breathing, detecting method for e.g. cardiac pacemaker, involves sensing physiological signal by sensor to derive respiratory parameter and detecting disturbance if parameter meet threshold**

**Original Titles:**

Apparatus and method for monitoring for disordered breathing

15/26, TI/6 (Item 6 from file: 350)

DIALOG(R) File 350: Derwent WPIX

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0014336979

WPI ACC NO: 2004-524939/

**Detection of respiratory disturbance, e.g. sleep apnea, comprises sensing physiological signal related to respiratory cycles, deriving respirator parameter from signal and detecting disturbance event**

**Original Titles:**

Method and apparatus for detecting respiratory disturbances

15/26, TI/7 (Item 7 from file: 350)

DIALOG(R) File 350: Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.  
0013800598

WPI ACC NO: 2003-900692/200382

**Obstructive sleep apnea detection and monitoring method using implantable medical device, involves determining presence of obstructive sleep apnea based on change in measured intracardiac impedance and movement of patient**

**Original Titles:**

IMPLANTIERBAR APNEA MONITOR

Method and apparatus to detect and monitor the frequency of obstructive sleep apnea

15/26, TI/8 (Item 8 from file: 350)

DIALOG(R) File 350: Derwent WPIX

(c) 2006 The Thomson Corporation. All rts. reserv.  
0013060381

WPI ACC NO: 2003-140149/200313

**Sleep respiratory events detection and treatment apparatus uses plural sensors to gather physiological data related to sleep respiratory events**

**Original Titles:**

METHOD AND APPARATUS TO DETECT AND TREAT SLEEP RESPIRATORY EVENTS

15/26, TI/9 (Item 1 from file: 348)

DIALOG(R) File 348: EUROPEAN PATENTS

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01953585

**IMPLANTABLE MEDICAL DEVICE WITH SLEEP DISORDERED BREATHING MONITORING**

15/26, TI/11 (Item 3 from file: 348)

DIALOG(R) File 348: EUROPEAN PATENTS

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01680812

**IMPLANTABLE APNEA MONITOR**

15/3,AB,IC/2 (Item 2 from file: 350)

DIALOG(R) File 350:Derwent WPIX

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0015435620

WPI ACC NO: 2005-784906/200580

XRPX Acc No: N2005-649873

**Implantable medical device (IMD) for treatment of e.g. sleep disordered breathing, has circulation delay (CD) module which measures patient's circulation delay by using output of oximeter and respiration data provided to processor of IMD**

Patent Assignee: CHO Y K (CHOY-I); ERICKSON M K (ERIC-I); GIESE C T (GIES-I); JOVANOVIĆ M (JOVA-I); MARKOWITZ H T (MARK-I); MEDTRONIC INC (MEDT); MEHTA P (MEHT-I); SOWELAM S (SOWE-I)

Inventor: CHO Y K; ERICKSON M K; GIESE C T; JOVANOVIĆ M; MARKOWITZ H T; MEHTA P; SOWELAM S

2 patents, 108 countries

**Patent Family**

Patent Number	Kind	Date	Application Number	Kind	Date	Update
US 20050251218	A1	20051110	US 2004569434	P	20040507	200580 B
			US 2004945639	A	20040921	
WO 2005110532	A1	20051124	WO 2005US15580	A	20050504	200580 E

Priority Applications (no., kind, date): US 2004569434 P 20040507; US 2004945639 A 20040921

**Patent Details**

Number	Kind	Lan	Pg	Dwg	Filing	Notes
US 20050251218	A1	EN	24	12	Related to Provisional	US 2004569434
WO 2005110532	A1	EN				

National Designated States, Original: AE AG AL AM AT AU AZ BA BB BG BR BW BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KM KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NA NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SM SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Regional Designated States, Original: AT BE BG BW CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IS IT KE LS LT LU MC MW MZ NA NL OA PL PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW

**Alerting Abstract US A1**

NOVELTY - A pacing module (60) has leads and electrodes (70) that sense cardiac events. An oximeter (40) measures relative amount of light absorbed by oxygenated hemoglobin to indicate degree of oxygen saturation. A respiration sensor (65) detects respiration. The output of oximeter and respiration data are provided to the processor (20) of IMD and used to measure patient's circulation delay with a CD module (30).

DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

1.a method of determining circulation delay;

2.a method of identifying patients receptive to overdrive pacing as

therapy for sleep disordered breathing; and

3. an implantable medical device system.

USE - For treatment of e.g. **sleep disordered** breathing, periodic breathing, Cheyne-Stokes respiration.

ADVANTAGE - Enables determination of patients that respond to pacing therapy for disordered breathing due to circulation delay measurements.

DESCRIPTION OF DRAWINGS - The figure shows the block diagram of a system for monitoring oxygen saturation and providing pacing therapy.

20 Processor  
30 A CD module  
40 Oximeter  
60 Pacing module  
65 Respiration sensor  
70 Leads and electrodes

#### Class Codes

International Classification (Main): A61N-001/18, A61N-001/36  
(Additional/Secondary): A61B-005/0205, A61N-001/20, A61N-001/22,  
A61N-001/34, A61N-001/362, A61N-001/39

#### Original Publication Data by Authority

##### Original Abstracts:

Oxygen saturation data is monitored during a predefined window to obtain a measurement of circulation delay. The measured circulation delay is used as a basis for determining therapies, including overdrive pacing. In some embodiments, circulation delay is used to identify patients that will benefit from overdrive pacing as a therapy for **sleep disordered** breathing.

15/3,AB,IC/10 (Item 2 from file: 348)

DIALOG(R) File 348:EUROPEAN PATENTS

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01922991

**IMPLANTABLE MEDICAL DEVICE AND METHOD FOR DELIVERING THERAPY FOR SLEEP -  
DISORDERED BREATHING**

**DISPOSITIF MEDICAL IMPLANTABLE ET METHODE DE TRAITEMENT POUR TRAITER UN  
TROUBLE RESPIRATOIRE DU SOMMEIL**

##### PATENT ASSIGNEE:

Medtronic, Inc., (3290928), 710 Medtronic Parkway, MSLC340, Minneapolis,  
MN 55432, (US), (Applicant designated States: all)

##### INVENTOR:

**CHO, Yong, Kyun**, 11849 65th Avenue North, Maple Grove, MN 55369, (US)  
**MARKOWITZ, Toby, H.**, 1670 Rigewood Lane South, Roseville, Minnesota 55113  
, (US)

PATENT (CC, No, Kind, Date):

WO 2005042088 050512

APPLICATION (CC, No, Date): EP 2004795940 041021; WO 2004US34845 041021

PRIORITY (CC, No, Date): US 693375 031024

DESIGNATED STATES: AT; BE; BG; CH; CY; CZ; DE; DK; EE; ES; FI; FR; GB; GR;  
HU; IE; IT; LI; LU; MC; NL; PL; PT; RO; SE; SI; SK; TR

EXTENDED DESIGNATED STATES: AL; HR; LT; LV; MK

INTERNATIONAL PATENT CLASS (V7): A61N-001/36; A61B-005/08

LANGUAGE (Publication,Procedural,Application): English; English; English

File 155:MEDLINE(R) 1950-2006/Jul 27

(c) format only 2006 Dialog

File 73:EMBASE 1974-2006/Jul 28

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File 34:SciSearch(R) Cited Ref Sci 1990-2006/Jul W4

(c) 2006 The Thomson Corp

File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec

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Set	Items	Description
S1	925	AU='CHO Y' OR AU='CHO Y K' OR AU='CHO Y.-K.'
S2	222	AU='CHO Y.'
S3	81	AU='CHO Y.K.'
S4	1	AU='CHO Y-K'
S5	6	AU='CHO YONG' OR AU='CHO YONG K' OR AU='CHO YONG KEUN'
S6	7	AU='CHO YONG-KUN':AU='CHO YONG-KYUN'
S7	4	AU='CHO YONGKEUN'
S8	141	AU='MARKOWITZ H' OR AU='MARKOWITZ H.' OR AU='MARKOWITZ H.T.'
S9	3	AU='MARKOWITZ HT'
S10	88184	SLEEP()DISORDER?? OR APN?A OR HYPOPN?A
S11	2	<b>S1:S9 AND S10</b>
S12	0	SDB AND IMD

11/6/1 (Item 1 from file: 155)

15140341 PMID: 15492313

**Diagnosis of sleep-related breathing disorders by visual analysis of transthoracic impedance signals in pacemakers.**

Oct 26 2004